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EXCAVATING ENGINEER

FOUNDED 1905

• Dragline with 60-ft. boom and 1½-cu. yd. bucket loads railroad cars with ash from dewatering pit at Lakeside Power Plant of Wisconsin Electric Power Company of Milwaukee, Wis.

ol. XL May, 1946 Number 5

Unmatched *STABILITY* while Walking or Working *

BUCYRUS MONIGHAN

Behind the speed with which Bucyrus-Monighan walking draglines handle stripping operations is their outstanding *stability* while walking or working. On a Bucyrus-Monighan, the revolving parts are positioned to locate the machine's center of gravity so that during operation it shifts through a limited range within the "kern" of the large circular base. That is why rim pressures of the base are kept safely low ... why there is so little "coning" of the ground under the machine ... why the operator can make use of all of the machine's speed and capacity ... why the unit can travel quickly and safely in places which stop other types of equipment.

* One of many reasons why

BUCYRUS-MONIGHANS ARE YEARS AHEAD

Sold by Bucyrus-Erie Co., South Milwaukee, Wis.

YOU'LL GET MORE WORK DONE WITH CUSHIONED-AIR PAVING BREAKERS

CC-60 and CC-80

Use Cushioned-Air Paving Breakers for those "trouble-shooting" jobs that must be done quickly and at low cost.

You see, Cushioned-Air lets us pack these 60- and 80-lb. breakers with that *extra* power that is required to speed up the work.

They'll stay on the job, too. For, even with their heavy wallop, the pistons of these two tools, thanks to Cushioned-Air again, cannot strike the fronthead. There is less shock to wearing parts—less breakage—less upkeep.

It's no wonder that users of Cushioned-Air Paving Breakers have such confidence in them. You, too, will like the way their dependable power gets jobs done.

AIR TOOLS
COMPRESSORS
CONDENSERS
ROCK DRILLS
TURBO BLOWERS
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LIKE A CHAMPION VAULTER...

FORM-SET ROPE IS *relaxed*

You marvel as his body clears the bar, then falls through space in a graceful arc. Thirteen, fourteen, fifteen feet he drops, yet he lands unhurt . . . because he's *relaxed.*

When handling Form-Set, Bethlehem's preformed rope, you'll notice much of that same relaxed effect. The reason is, of course, that the preforming process shapes each wire and strand to a permanent helix—a shape they retain through the life of the rope. Even though the rope be cut or broken, the wires and strands "stay put." They don't bush out or pop from the core.

This is because the tension is gone—relieved by preforming. The rope is *relaxed.*

What does this bring you? Easier handling, for one thing. More important still, a preformed line is much less subject to bending fatigue. On applications where bending stresses are high, a Form-Set rope has longer life. This means greater economy . . . fewer replacements . . . fewer reriggings.

No matter what rope you want—no matter what grade, type, or size—you can get it with the Form-Set feature. Details are available through the nearest Bethlehem representative.

This is Form-Set rope. The strands have been lifted out by hand. Note how the wires lie smoothly in place. There is no inner tension to force them apart.

When you think WIRE ROPE . . . think BETHLEHEM

EXCAVATING ENGINEER

FOUNDED 1905

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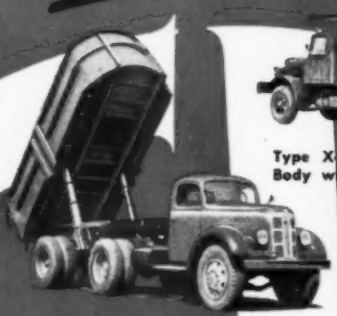
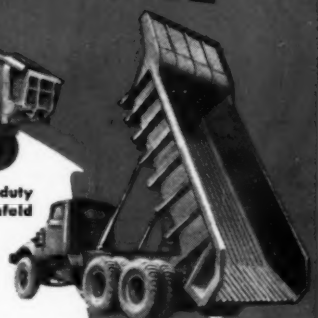
One way side dump Body with dual telescopic Hoist. Automatic downfold gate.



Type Q12 Body with Model T440 dual telescopic Hoist. Capacity 16 cu. yds.

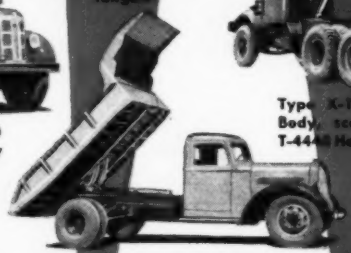
Type X-112 Extra heavy duty Body with automatic downfold tailgate



Type X-112 Extra heavy duty Body, scoop end with Model T-444 Hoist. Capacity 19 cu. yds.

Rock excavating Body with downfolding gate.

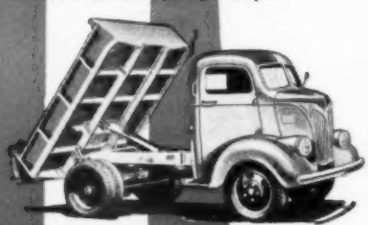
Type W12 Body—Model F4C cam and roller Hoist. Capacity 5 cu. yds.



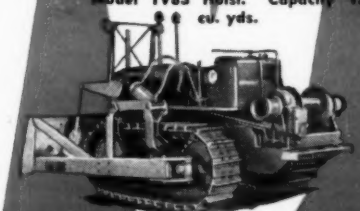
Special scoop end mucker Body. Model F8B cam and roller Hoist. Capacity 5 cu. yds.

Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.

Telescopic boom Crane. Radius 8 to 20 feet.

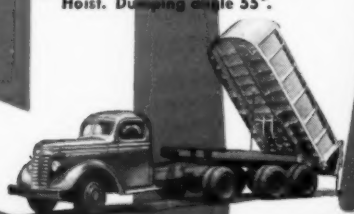


Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.

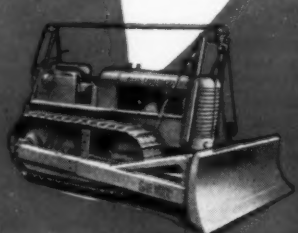


Bulldozer and rear mounted Winch.

Type W12 Body and single telescopic Hoist. Double acting tail-gate Capacity 4 cu. yds.



West Coast Special W-12 Body. Model F8C cam and roller Hoist. Capacity 10 cu. yds.



Cable Dozecaster with angling blade.

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INDEPENDENT CROWD plus AUTOMATIC CROWD
FOR GREATER DIGGING POWER
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- **Simplicity of design**
  —for easy upkeep in remote areas.
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  —utilizes force other shovels waste.
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  —easy operation without fear of shut down because of control failure.
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  —reduces overloads on parts under power in heavy digging.
- **Helical Gear Drive**
  —there is no finer power take-off.
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  —trouble-free—fewer adjustments—smooth operation.
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  —minimum loss of power to friction.
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  —makes possible quick conversion for stripping, batch plant or bin loading, sewer work, backfilling and other jobs that can be handled better with a Crane or Dragline.

Here is a combination of advantages that is exclusively Northwest—it's a real Rock Shovel that has proved itself in rock and hard digging everywhere. There is a size for every problem. Let us send you details on the size machine that interests you.

If it's a real Rock Shovel you won't have to worry about output in dirt

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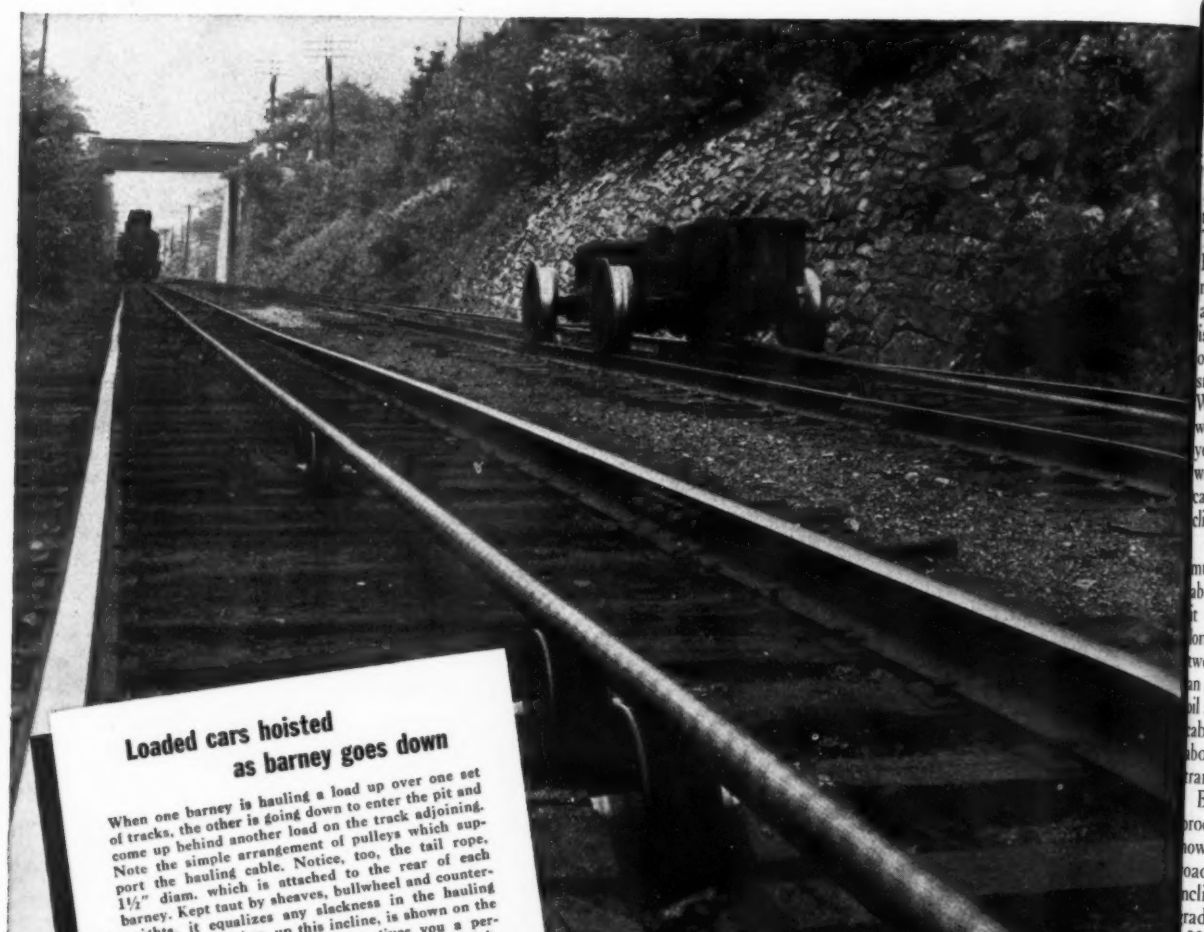
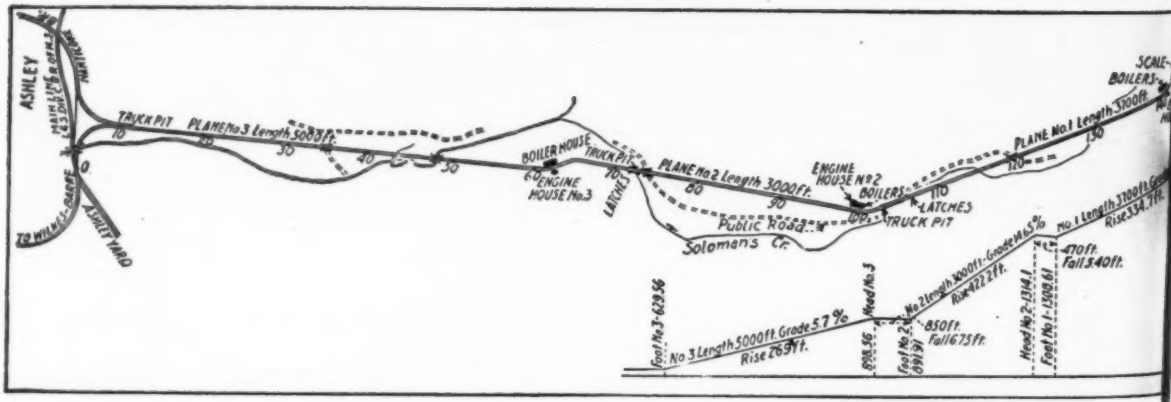
Convertible for any Mining, Material Handling or Excavating Problem

Hauling 27,972,495 tons of freight



Loaded cars hoisted as barney goes down

When one barney is hauling a load up over one set of tracks, the other is going down to enter the pit and come up behind another load on the track adjoining. Note the simple arrangement of pulleys which support the hauling cable. Notice, too, the tail rope, 1½" diam. which is attached to the rear of each barney. Kept taut by sheaves, bullwheel and counterweights, it equalizes any slackness in the hauling cable. Another view, up this incline, is shown on the opposite page. There the camera gives you a perspective of the slope. The rise is 422.2 ft. in 3,000 ft. —a 14.65% grade.



over the famous Ashley Planes

AMERICAN EXCELLAY PREFORMED TIGER BRAND Wire Rope sets records for top performance over 100 year period

WILKES-BARRE in the heart of the Anthracite field is three miles from Ashley, Pa., where the Ashley Planes are located. From Ashley to the mountain top it is 1,000 feet up. The grade of the famous Ashley Planes is such that a locomotive cannot negotiate it economically. The alternate route around the mountain is 12.41 winding miles of heavy grade over which a locomotive can haul a small tonnage train at slow speed. With brilliant foresight the engineers who planned the Ashley Planes 100 years ago, chose to do it the hard way. They proposed to haul freight cars up Solomon's Gap, on three inclined planes—*by wire rope.*

As revolutionary as this project must have been in 1843, the remarkable fact is that repeated tests prove it to be more economical than the longer route, even today. Under twenty-four hour operation, hauling an average of one million tons of coal, oil and mixed freight per month—this cable-hauled railroad equipped with about 100 tons of wire rope reduces transportation costs very materially.

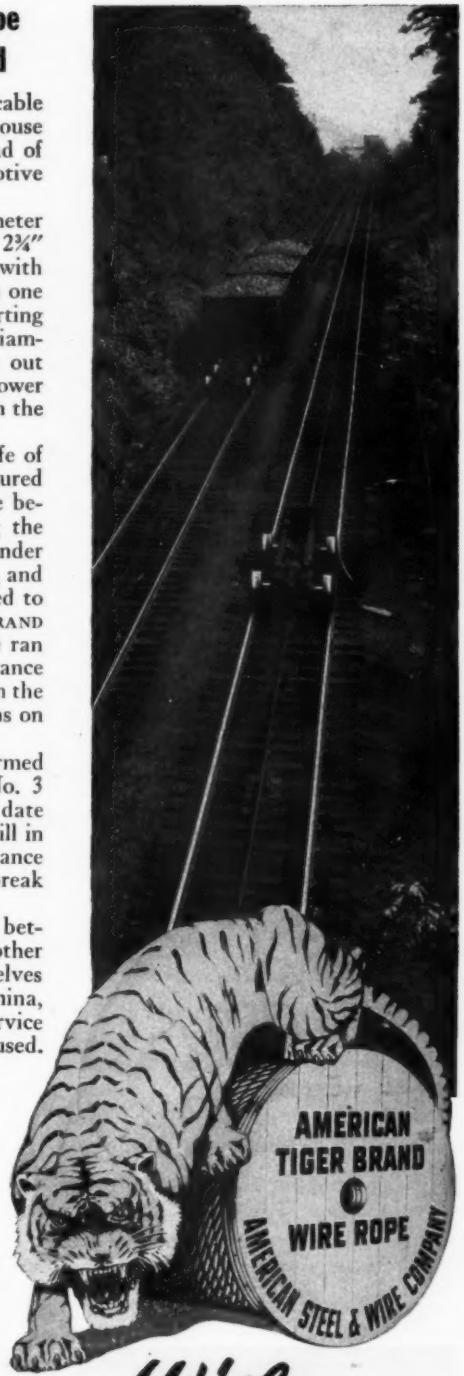
Best visualized by the profile reproduced at left, the Ashley Planes, now operated by the Central Railroad of New Jersey, consist of three inclines of 5.7%, 14.65%, and 9.28% grade respectively. The total rise is 1,035.9 ft. up which 35 to 45 cars are hauled hourly at from 12 to 30 mph. Each plane is a self-contained unit. It consists of a double track (with a truck pit at the foot of each track), and is equipped with its own hauling cable and two cable trucks or "barneys". A power house with hoisting engine at the head of each plane furnishes the motive power.

The hauling cable (2½" diameter on the top and bottom planes, 2¾" diameter on the middle plane with the heaviest grade) passes from one barney up the plane over supporting pulleys, then around 24-ft. diameter twin traction drums, then out through the bottom of the power house and back to the barney on the parallel track.

Close check is kept on the life of these hauling cables, and is measured in terms of tonnage hauled. We believe it significant that during the years when the planes were under full wartime capacity operation, and the equipment was being worked to the limit, American TIGER BRAND Excellay Preformed Wire Rope ran up the highest tonnage performance ever recorded! 19,804,642 tons on the No. 2 plane; and 27,972,495 tons on the No. 3 plane.

TIGER BRAND Excellay Preformed Wire Rope installed on the No. 3 plane in November 1943 has to date hauled 27,972,495 tons and is still in excellent condition. The performance of these ropes continues to break previous records.

These figures — substantially better than the former best with other wire rope used—speak for themselves as proof of the superior stamina, greater ruggedness and better service TIGER BRAND delivers, wherever used.



AMERICAN STEEL & WIRE COMPANY
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TIGER BRAND *Wire Rope*

Large 350-ton Bucyrus walking dragline powered by one 6 cylinder Cooper-Bessemer Diesel which is direct-connected to the walking mechanism and dragline. It also drives a generator for all electrical requirements including motor drive of boom.

In Paul Bunyan's Coal Shovel...

a Cooper-Bessemer Diesel proves its stamina

THIS 350-ton giant, a walking dragline that takes seven-foot strides, could easily qualify as Paul Bunyan's coal shovel. Forty-five feet high, with a 160-foot reach and a 6-cubic-yard bite, it has been scraping up as much as 1,000 tons per day for the past two years in a western Pennsylvania strip mining operation.

Power for walking as well as digging comes from one six-cylinder Cooper-Bessemer Diesel. It is one of the most gruelling types of service known to engines.

However, routine checkups have shown surprisingly little wear of major engine parts. Main bearings have remained in excellent shape. Crankpins have shown no sign of scratching. Cylinder liners have stayed smooth, clean and round. Pistons and rings are practically like new. In short, here is a consistent record of true stamina and outstanding performance.

This engine's year-after-year reliability adds to a mountain of proof that you can always count on rugged Cooper-Bessemers for exceptionally long life and continuous trouble-free operation.

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GENERAL DEEP CLEAT

Equipped with General Deep Cleat Tires, this Adams Motor Grader is widening and grading near Norton, Kansas.

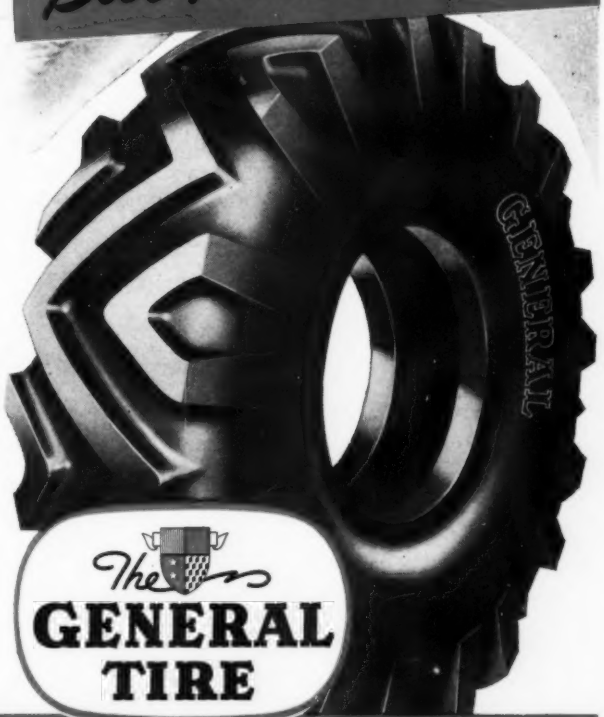
Best Tire "on earth"

THE GENERAL'S "deep bite" tread was specially designed by America's foremost quality tire engineers to give *maximum traction* on soft ground, mud, sand or gravel.

The best tire "on earth"... the General Deep Cleat . . . is self-cleaning . . . built for rugged service with exclusive "shock absorber" construction that resists abuse and service damage.

For longer, low cost tire service, equip driving wheels with General Deep Cleats . . . trailing wheels, too, if all tires are to be interchangeable.

THE GENERAL TIRE & RUBBER CO.
AKRON, OHIO

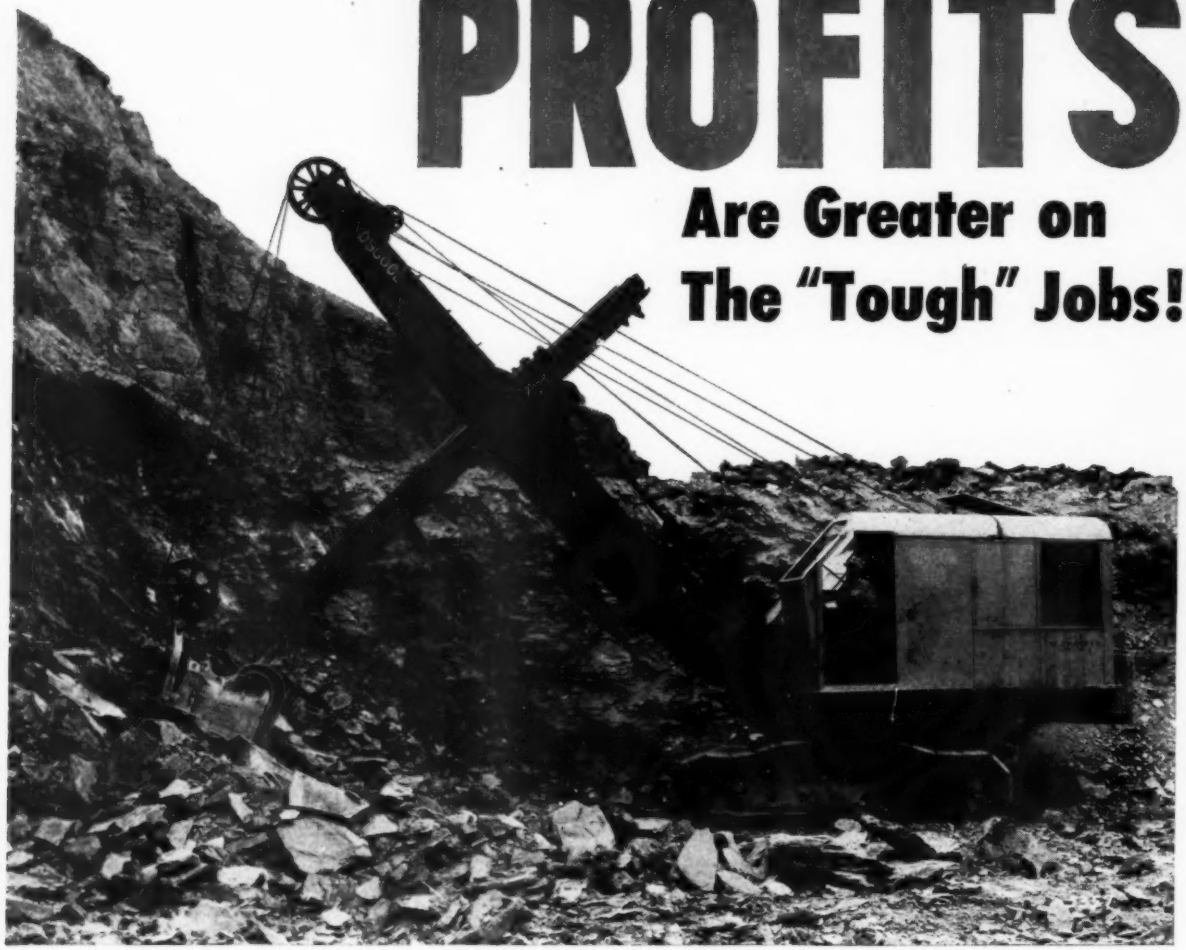


The GENERAL TIRE

GENERAL *OFF-THE-ROAD* TIRES

PROFITS

Are Greater on The "Tough" Jobs!



"TOUGH" construction jobs can be the most profitable . . . IF your equipment can stand up under punishing service and the most difficult operating conditions. Experienced contractors know that OSGOOD equipment is designed and built to provide dependable, economical service under any conditions . . . that's why you'll see OSGOOD equipment on most of the big construction jobs.

Since 1872, OSGOOD has built equipment—power shovels, cranes, draglines, clamshells, backhoes and pile drivers—engineered to do the job faster, better and at lower cost. Plan now to enjoy the advantages that only OSGOOD, with its three quarters of a century of manufacturing experience can provide. You'll have an "edge" in bidding on those "tough" jobs of the future if you'll plan to use OSGOOD equipment . . . . . built to take the toughest jobs in stride!

THE GENERAL EXCAVATOR COMPANY
CRANES, DRAGLINES AND SHOVELS
DIESEL, GAS, ELECTRIC

Associated with The General Excavator Company

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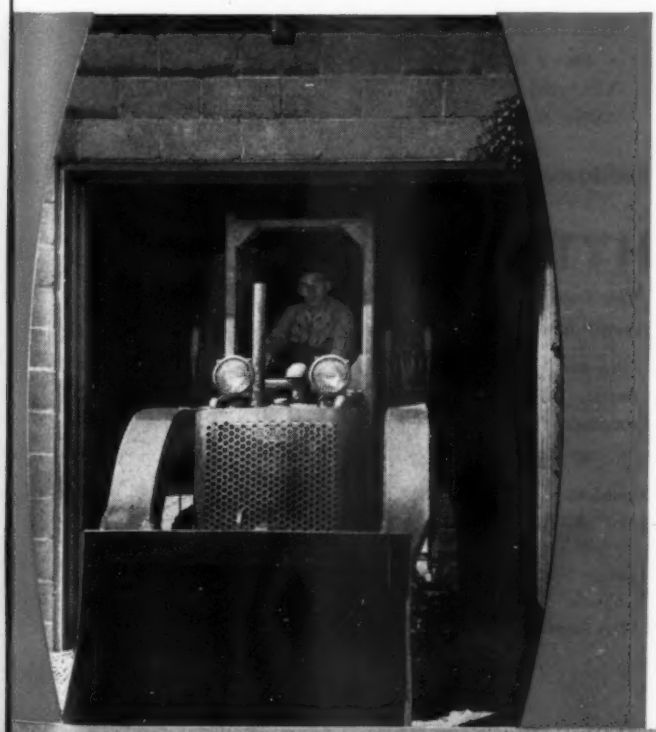
THE OSGOOD COMPANY • MARION, OHIO

OSGOOD
SHOVELS, DRAGLINES CRANES
CRAWLER & WHEEL MOUNTS
DIESEL, OIL, GAS, ELECTRIC

The number of jobs you can handle efficiently automatically shoots upward when you get a Bucyrus-Erie DOZER-SHOVEL because this unit has the ability, unique among front end loaders, to get into and around in places where use of machinery was formerly considered impossible. The DOZER-SHOVEL'S low clearance (7'5" for TD-6; 8'1½" for TD-9) lets it squeeze through low narrow openings; its compactness and exceptional maneuverability permit it to swing fast and work at high speed in well ventilated tunnels, small mines, warehouses, shipholds, etc. It digs, lifts, swings, and dumps in places otherwise inaccessible — gets in where others can't to do the work you want done in a hurry. Between jobs, the DOZER-SHOVEL is easily, quickly transported on a trailer. Its low overall height enables it to clear highway obstructions with ease, lets you house the machine in a garage without special doors. See your International TracTracTor Distributor for full details. He'll tell you about the many other DOZER-SHOVEL features too: Its versatility, retention of inherent tractor characteristics, balance, full front visibility, convertibility, easy control, oscillating tracks.



BUCYRUS ERIE

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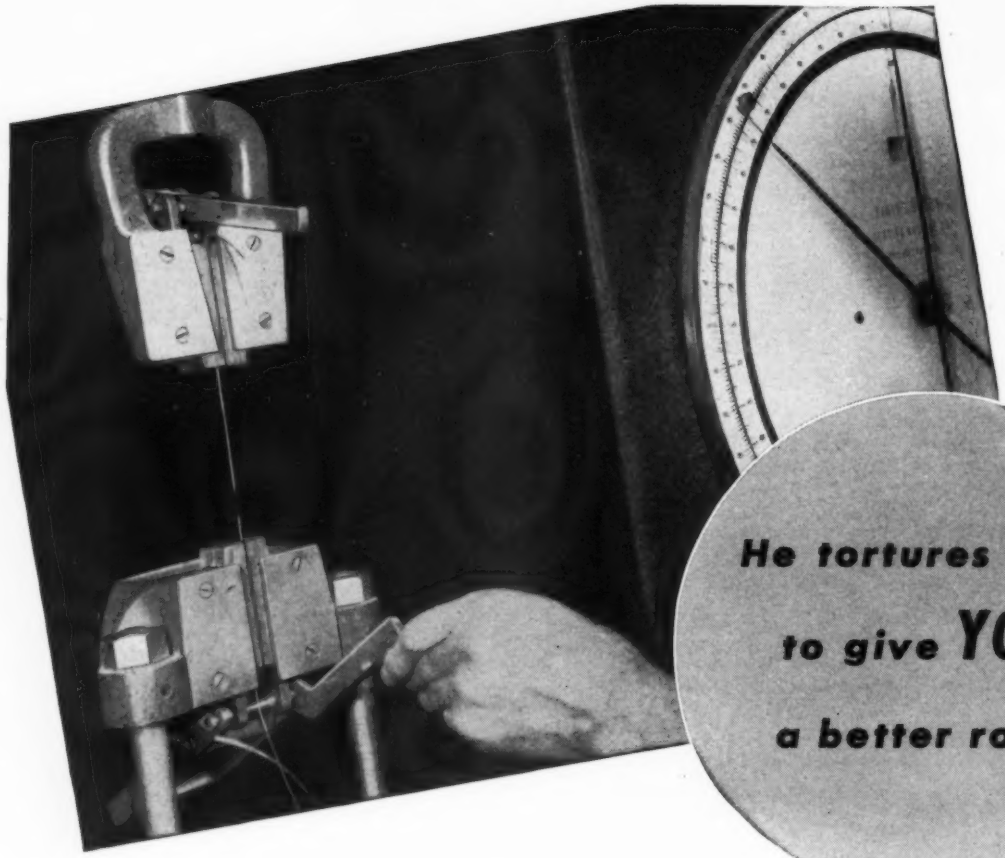

He tortures wire to give YOU a better rope

This Macwhyte laboratory technician is working in *your* interest. He gives the strength test to samples from each end of every coil of wire we make. Each sample is stretched to the breaking point. If it passes the test, the coil is tagged OK and used for Macwhyte Wire Rope. If not up to standard, the wire is rejected.

To make sure Macwhyte Rope will give you maximum service, the finished wire is also given a torsion or twist test to check its stamina. Granular structure is analyzed by a microscopic camera. Wire samples are rotated in an arc by a special machine that checks their ability to withstand fatigue.

Strict metallurgical control is another reason you can always depend on Macwhyte Wire Rope for long, economical life.

Make MACWHYTE your headquarters for WIRE ROPE and SLINGS

Macwhyte Wire Rope Catalog, G-15. 170 pages. Lists Macwhyte's full line, gives complete manufacturing story. Ask any Macwhyte representative or write Macwhyte Company.

MACWHYTE COMPANY

Wire Rope Manufacturers

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Distributors throughout the U. S. A. and other countries

★ ★ ★ ★

MACWHYTE PREformed and Non-PREformed Wire Ropes—
Internally Lubricated . . . MONARCH WHYTE STRAND
Wire Rope . . . Special Traction Elevator Rope . . .
Braided Wire Rope Slings . . . Aircraft Cables,
Assemblies and Tie-Rods . . . Stainless Steel Wire Rope,
Monel Metal Wire Rope, Galvanized Wire Rope.

MACWHYTE COMPANY 50th Year 1896 – 1946

All You Need is a LICENSE TAG—

—to Haul on the Highway with MISSISSIPPI WAGONS!

* * *

Yes—and Mississippi Wagons are the ONLY hauling units of their type on which a license tag can be used!

Four-axle construction, made possible by the weight-transfer feature found exclusively on Mississippi Wagons, is the reason for their ability to operate efficiently, legally, and economically both ON and OFF the highway.

Four axles not only provide maximum flotation over soft ground on construction work, but serve to reduce axle-loadings for road and street travel. As a result, the Mississippi Wagon is the only bottom-dump hauling unit powered by a heavy industrial tractor that can haul payloads of 27,000 pounds on highways without exceeding the 18,000-pound axle-loading limit set by most states.

With all-round performance like this available, why make or carry a double investment in hauling equipment? Let a single investment in MISSISSIPPI WAGONS put you in a position to handle both construction and long-haul jobs . . . at costs that will enable you to meet and beat tough competition in the big days ahead.

COMPARE THESE FIGURES WITH YOUR PRESENT COSTS FOR HIGHWAY HAULING!

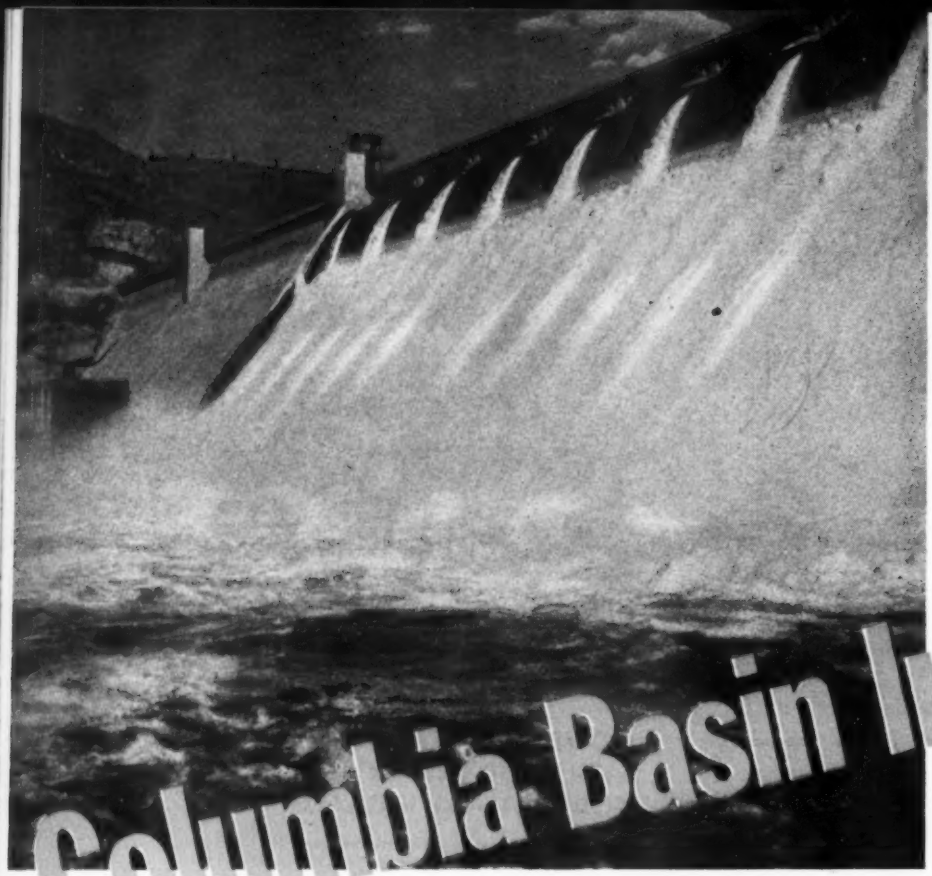
Following are the approximate costs per ton-mile for hauling with Mississippi Wagons:

LENGTH OF HAUL ONE WAY	TONS A DAY PER WAGON	COST PER TON-MILE
5 miles	202	3.5¢
10 "	115	3.1¢
15 "	81	2.9¢
50 "	27	2.6¢

The figures are based on a 10-hour day, an average speed of 20 m.p.h., payloads of 27,000 pounds, 10 minutes loading and dumping time per trip, and a total daily cost of $35.00 per Wagon, covering fuel, lubricants, driver's wage (average), reserves for depreciation, repair parts and labor, tire wear over abrasive concrete roads, insurance, social security, and miscellaneous expense.

M-R-S MANUFACTURING COMPANY, Jackson, Mississippi

MISSISSIPPI WAGON *The World's Most Modern Hauling Unit*



Columbia Basin Irrigation

Opening of bids on 6½ miles of Main Canal is start of Bureau of Reclamation's $300,000,000 construction program for the Columbia Basin Irrigation Project of south-central Washington. Expect more than 2,000,000 cu. yds. of earth and rock will be moved in next two years.

By GRA[illegible]PATRICK

• Grand Coulee Dam and the Columbia River will furnish the power and water for the Columbia Basin Irrigation Project.

THE MORRISON-KNUDSEN Co., Inc., Seattle, was low bidder at $619,000 for excavating 6½ miles of the Main Canal for the Columbia Basin Irrigation Project of south-central Washington when first bids called in the $300,000,000 construction program were opened at Coulee Dam, Wash., March 20. Sixteen firms entered bids. The bids were sent to the Denver offices of the Bureau for review.

Other bids were Nat McDougall, Portland, Ore., $1,173,000; F. R. Hewitt Co., Spokane, $869,800; Peter Kiewit & Sons Co., Seattle, $775,000; Marshall & Haas, San Mateo, Calif., $635,000; Axle Osberg & Colonial Construction Company, Spokane, $889,000; Guy F. Atkinson, Portland, $842,600; M. E. Nelson Construction Co., Inc., Ephrata, $659,000; McNutt Brothers, Eugene, Ore., $869,600; General Construction Co., Seattle, $666,000; Fiorito Brothers, Seattle, $888,000; McLaughlin, Inc., and Union Construction Company, Great Falls, Mont., $819,000; N. Fiorito Co., Seattle, $664,500; K. L. Goulter & Co., Seattle, $663,000; Matthew S. Ross, Los Angeles, $780,400; and J. A. Terteling & Son, Inc., Boise, $667,600.

Although not preceded by as much fanfare as some openings of bids for the building of the giant Grand Coulee Dam—which, of course, had to be built before the Columbia Basin Project could be started, for it is Grand Coulee which will furnish the power to pump the water of the Columbia River for irrigation purposes—there was still an air of expectancy felt when Roy B. Williams, acting supervising engineer, and H. A. Parker, irrigation engineer, for the Bureau of Reclamation, announced the results of the bidding. A large crowd of bidders and onlookers had gathered.

Although this was a comparatively small contract, it marked

• Colored line shows the approximate position of earthfill dam in the Upper Grand Coulee, 1.6 miles from Grand Coulee Dam, to form the north end of the 27-mile equalizing reservoir, in the water-distributing system of the Columbia Basin Reclamation project.

the beginning of a job which Frank A. Banks, Bureau of Reclamation engineer who was in charge of building Grand Coulee Dam and who is now supervising engineer for the Bureau for the Columbia Basin, described by saying:

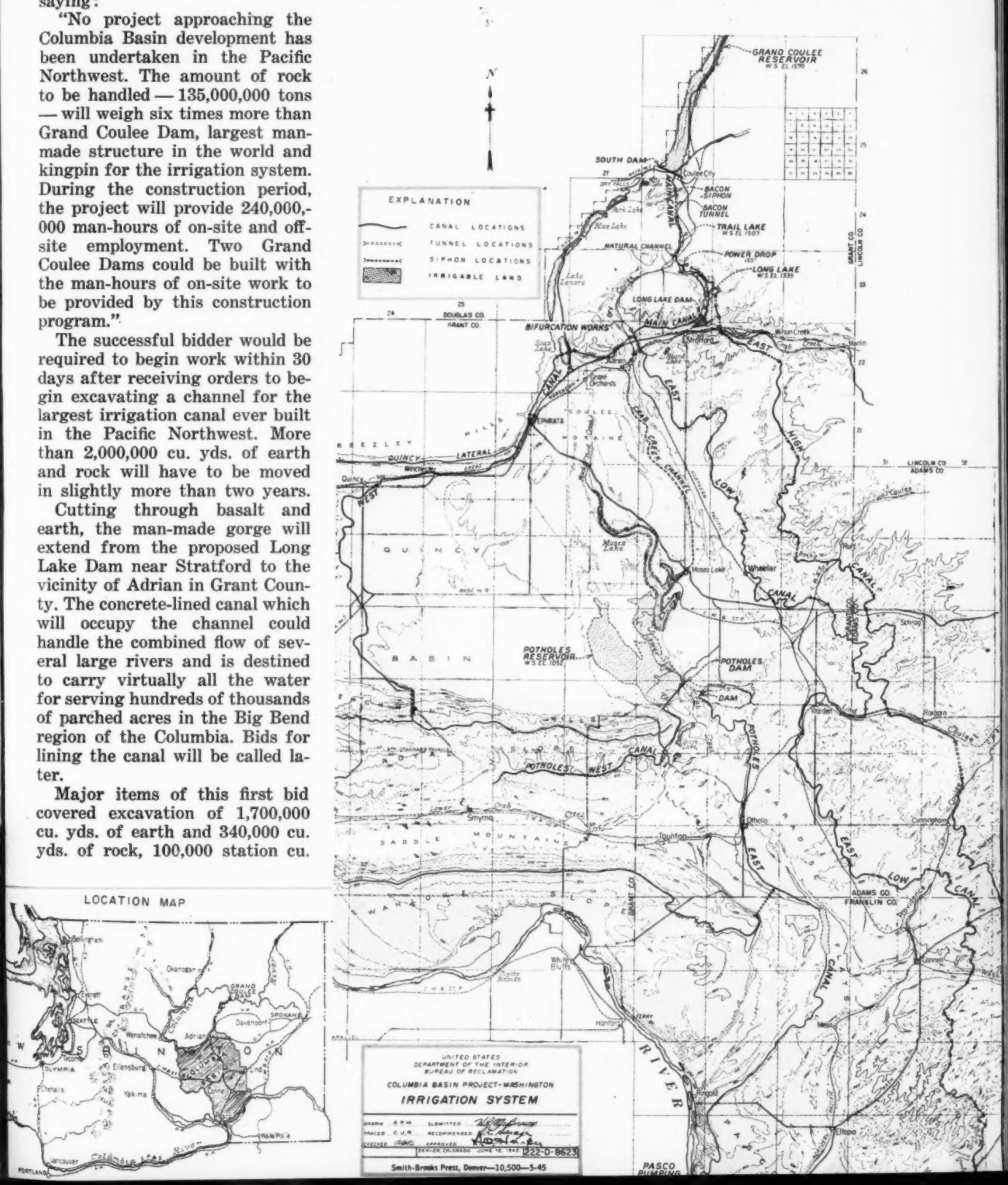
"No project approaching the Columbia Basin development has been undertaken in the Pacific Northwest. The amount of rock to be handled — 135,000,000 tons — will weigh six times more than Grand Coulee Dam, largest man-made structure in the world and kingpin for the irrigation system. During the construction period, the project will provide 240,000,000 man-hours of on-site and off-site employment. Two Grand Coulee Dams could be built with the man-hours of on-site work to be provided by this construction program."

The successful bidder would be required to begin work within 30 days after receiving orders to begin excavating a channel for the largest irrigation canal ever built in the Pacific Northwest. More than 2,000,000 cu. yds. of earth and rock will have to be moved in slightly more than two years.

Cutting through basalt and earth, the man-made gorge will extend from the proposed Long Lake Dam near Stratford to the vicinity of Adrian in Grant County. The concrete-lined canal which will occupy the channel could handle the combined flow of several large rivers and is destined to carry virtually all the water for serving hundreds of thousands of parched acres in the Big Bend region of the Columbia. Bids for lining the canal will be called later.

Major items of this first bid covered excavation of 1,700,000 cu. yds. of earth and 340,000 cu. yds. of rock, 100,000 station cu. yds. of overhaul, and about 300,000 cu. yds. of compacting embankment.

Excavation for the canal and other work to be performed under private contract may result in the employment of 2,000 men in the Basin by midsummer. The Bureau hopes to let $40,000,000 in contracts during the next few months and predicted that employment on the project may reach 7,000 a year hence. Although 1946 will be only the beginning of the



irrigation system designed to carry the waters of the Columbia River to more than a million acres of central Washington, the proposed program for the next six months calls for the start of three dams, three principal canals, three siphons, one tunnel, two pumping plants, and a lateral system to serve 5,888 acres.

Other contracts for further work on the main irrigation canals and for Potholes Reservoir Dam are expected to be let in May, and contracts for work close to the site of Grand Coulee dam will be let about July 1, according to Banks.

During April, the Bureau of Reclamation called for bids on the 10,000-ft. South Coulee Dam, for excavating and lining the first 6½ miles of the 88-mile West Canal (including two concrete siphons), and a lateral system for the Pasco Pumping Plant near the southerly end of the project area. Following are the bid-opening dates: South Coulee Dam, May 10; first 6½ miles of West Canal, May 15; and Pasco Lateral System, May 17. All openings will be at Coulee Dam.

A complete summary of the irrigation features of the Columbia Basin Project, on which the construction is expected to begin in 1946, with technical details as to what the work involves, is given by Parker, Bureau of Reclamation irrigation engineer, as follows:

Note: All quantities in this summary are subject to change when final designs are made.

DAMS

South Coulee Dam

This dam will be at the south end of the Grand Coulee regulating reservoir and will be located with its southeast end adjacent to the town of Coulee City. It will be an earth and rock filled dam about 10,000 feet long, with a maximum height of about 65 feet. The total volume of the fill will be about 1,500,000 cu. yds., including about 96,000 cu. yds. of riprap on the upstream and a rock fill on the downstream face. There will also be a headworks for the Main Canal, and a minor channel change to divert a channel into the reservoir at the east end of the dam.

ESTIMATED DIMENSIONS AND QUANTITIES OF MATERIALS

EARTHFILL DAMS (4)

Total Length	27,890 ft.
Earth and Rock Embankment	15,500,000 cu. yds.

PRINCIPAL CANAL PROJECTS (9)

Total Length	475.1 miles
Cubic Yards Earth Excavation	41,134,500
Cubic Yards Rock Excavation	14,657,800
Cubic Yards Rolled Embankment	7,415,500
Cubic Yards Concrete	2,103,600

SIPHON PROJECTS (46)

Total Length	147,323 ft.
Cubic Yards of Concrete	322,000
Tons Structural Steel	58,725
Tons Reinforcing Steel	26,825
Cubic Yards Earth Excavation	1,022,000
Cubic Yards Rock Excavation	351,000

TUNNEL PROJECTS (4)

Total Length	25,150 ft.
Cubic Yards Excavation	546,065
Tons Steel Supports	6,080.5
Million Board Feet Timber	2,830
Cubic Yards Concrete Lining	116,500

FOUR EARTHFILL DAMS

Dam	Maximum Height (ft.)	Crest Length (ft.)	Embankment Volume (cu. yds.)
North Dam for Grand Coulee Equalizing Reservoir	90	1,360	1,100,000
South Dam for Grand Coulee Equalizing Reservoir	63	9,880	1,400,000
Long Lake	100	1,650	1,000,000
Potholes	110	15,000	12,000,000
			15,500,000

46 SIPHON PROJECTS

Canal	No. Siphons	Total Length (ft.)	Diameter of Siphons	Cu. Yds Concrete	Ecavation (Cu. Yds.) Earth	Rock
Main	1[1]	1,013	23'-3"	13,000	3,000	2,000
West	5	32,350	18'-3" to 24'-6"	91,000	282,000	73,000
West Laterals	4	16,350	6'-2" to 12'-0"	22,000	57,000	57,000
East Low	30[2]	70,230	7'-0" to 16'-2"	175,000	616,000	210,000
Potholes East	2	2,600	8'-0" to 20'-0"	5,000	23,000	3,000
Potholes East Laterals	4	24,780	5'-9" to 17'-3"	16,000	41,000	6,000
Total	46	147,323		322,000[3]	1,022,000	351,000

[1]Double barrel [2]Includes 19 double-barrel siphons [3]Includes barrels, piers, and anchors

FOUR TUNNEL PROJECTS

Canal and Tunnel	Length (ft.)	Diameter	Cu. Yds. Excavation	Tons Steel Supports	M.B.F. Timber Supports	Cu. Yds. Concrete Lining
Main Canal						
Bacon Tunnel (twin-bore)	10,000	23'-1"	376,000	3,922.5	1,800	77,800
West Canal						
Low Gap Tunnel	9,150	16'-7"	91,605	1,300.5	600	21,200
East Low Canal						
Dunnigan Tunnel	2,000	11'-0"	9,460	107.5	90	2,700
Potholes East Canal						
Soda Lake Tunnel	4,000	22'-0"	69,000	750	340	14,800
	25,150		546,065	6,080.5	2,830	116,500

GRAND COULEE DAM PUMPING PLANT

Concrete	81,000 cu. yds.
Reinforcing Steel	6,937.5 tons
Rock Excavation	2,500 cu. yds.
Floor finish-cement	125,000 sq. ft.
Floor finish-terrazzo	5,000 sq. ft.
Membrane roofing	52,000 sq. ft.
Composition roofing	20,000 sq. ft.

NINE PRINCIPAL CANAL PROJECTS

Canal	Length (miles)	Cu. Yds. Earth	Cu. Yds. Rock	C. Y. Rolled Embankment	Cu. Yds. Concrete
Feeder	1.6	614,800	665,700	65,000	30,000
Main	13.1	1,230,200	2,805,800	624,800	106,000
West	78.3	9,769,700	1,763,800	987,600	361,600
West Laterals	56.9	916,900	216,500	256,700	178,800
East Low	137.7	19,567,200	4,639,300	2,768,300	499,000
East Low Laterals	41.7	622,100	71,500	143,000	119,000
Potholes West	16.2	175,100	287,800	79,700	41,000
Potholes East	51.6	4,096,000	3,485,900	1,653,200	366,500
Potholes East Laterals	78	4,142,500	721,500	837,200	401,700
Total	475.1	41,134,500	14,657,800	7,415,500	2,103,600

• Gently rolling land characterizes much of the Columbia Basin Project. This expanse, near Moses Lake, will be the site of a predevelopment farm where irrigation and crop growing will be studied under a joint venture by Washington State College, the Bureau of Plant Industry, and the Bureau of Reclamation. In the background is one of the many herds of horses that roams in the Basin, much of which now is capable only of supporting limited grazing.

Long Lake Dam

Long Lake Dam will be located north of Brook Lake about 12 miles south of Coulee City and about 17 miles northeast of Ephrata. It will form the Long Lake reservoir which will be a part of the Main Canal. The dam will be an earth and rock fill structure 1,700 feet long, with a maximum height of 100 feet, and will require approximately 2,000,000 cu. yds. of fill. It also will have a rock spillway at the east end.

Potholes Dam

This dam will be located about 10 miles south of the town of Moses Lake and 12 miles west of the town of Warden. It will form the Potholes reservoir, from which the southern part of the project will be irrigated. It will be an earth fill dam about three miles long with a maximum height of about 125 feet, and will contain about 10,000,000 cu. yds. of fill.

It will have outlet works at the east end for the 60-mile Potholes East Canal which will be one of the largest canals on the project, and outlet works at the west end for the Potholes West Canal which will be a smaller canal. There also will be a rock spillway near the west end. A comparatively small outlet will be required through the base of the dam.

CANALS

Main Canal

The Main Canal will take out of the Grand Coulee reservoir, at the South Coulee Dam, about one-half mile west of the town of Coulee City. It will have a capacity of 13,200 second feet. From station 0+00 to station 59 it will be unlined, with a bottom width of 50 feet and water depth of 35.8 feet. From station 59+00 to station 93+50 it will be a concrete lined canal, 24 feet wide on the bottom with a water depth of 23.68 feet, and side slopes of 1½:1. The center line cut will vary from a minimum of 22 feet to a maximum of 74 feet.

The material to be excavated will consist mostly of lava rock, with a small amount of earth, sand, and gravel between station 10 and station 20. A rough estimate of the principal quantities follows: rock, 1,800,000 cu. yds.; common, 220,000 cu. yds.; concrete lining, 6,000 cu. yds.

The Bacon siphon will be from station 93+50 to station 103+00. It will be nearly 1,000 feet long with a maximum head of 100 feet and will have a two-barrel reinforced concrete siphon, each barrel being about 23 feet in diameter. One barrel will be built soon and the other one left for the future. The Bacon tunnel will be from station 103+00 to station 203+00. It will have the same number of barrels as the Bacon siphon, with about the same diameters, and will be concrete lined. Only one barrel will be built now. The surface indications are that the entire tunnel will be in basalt rock.

From station 203+00 to station 264+25 there will be unlined canal with a bottom width of 46 feet and a water depth of 22.36 feet. The center line cut will average about 20 feet. The approximate excavation quantities are: rock, 350,000 cu. yds.; common, 45,000 cu. yds.

Trail Lake, an intermittent lake which is dry except during spring and winter floods will be located from station 264+25 to station 324+00. No construction is planned for this lake, but some diking may be done later if too much leakage develops.

From station 324 to station 430 there will be an unlined canal with a bottom depth of 120 feet and a water depth of 14.13 feet. A rough estimate of the construction quantities is: rock, 270,000 cu. yds.; common, 160,000 cu. yds. There will be a highway bridge across the canal at station 328+66 in connection with a change in the county road location. The road change will be about 3,500 feet long and will require 12,000 cu. yds. of common and 6,000 cu. yds. of rock excavation in addition to a timber bridge over a small channel change. There will be a bridge at station 409 where the canal

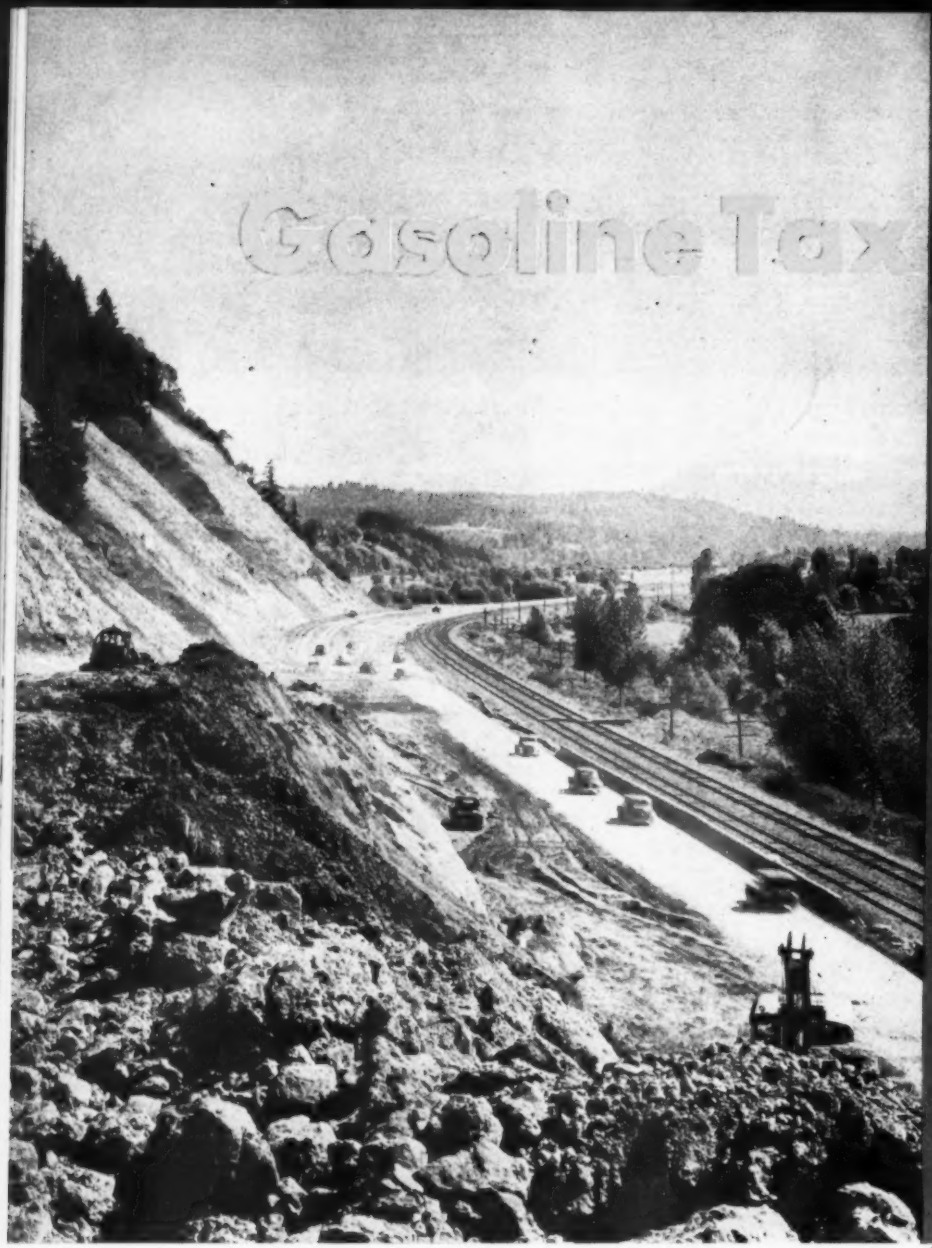
(Continued on page 274)

• Scrapers removing top soil from the right-of-way for the feeder canal which will carry water from the pumping plant headworks to the reservoir on the floor of Grand Coulee. This canal will extend from the center foreground to center background of this picture, cutting a path about as wide as the scraper in the foreground.

Gasoline Tax Survey

With the Federal Government committed under the new Federal-aid law to grant the unprecedented sum of $1,500,000,000 to the states during the next few years for roads, the responsibility of the states to adopt sound highway financing policies is correspondingly greater than ever before. A survey reveals that a trend is toward increasing gasoline taxes to assure receipt of full benefits of Federal assistance.

By BETHUNE JONES



• Cuts up to 220 ft. are being made on hills to relocate Route 99 north of Woodland, Wash. Ripper on higher level loosens material for scraper loading. Shovel on lower level loads to trucks.

A SURVEY OF REPORTS from state capitals shows that bills proposing higher gasoline taxes for additional highway construction funds were introduced this year in the legislatures of at least five states, with indications that such measures will be more widely sought in 1947 when a greater number of lawmaking bodies will convene.

Virginia's legislature, on recommendation of Gov. William S. Tuck, enacted a bill increasing that state's gasoline tax from five to six cents a gallon, effective on or about July 1. Other higher gasoline tax bills were still pending at this writing in Kentucky, Massachusetts, Mississippi and Rhode Island.

Despite stubborn opposition from gasoline retailers, the Virginia increase was backed by the Virginia Highway Users' Association because it was enacted as part of a program which included repeal of the state's three per cent gross receipts tax on motor trucks. Also included in the program were a 25 per cent reduction in passenger car license costs and an increase in truck license fees.

Legislation to increase Kentucky's gasoline tax from five to six cents a gallon and to levy a new tax of one cent a quart on oil was being opposed on the claim that out-of-state purchases would be encouraged. Bills pending in Massachusetts sought an increase in that state's gasoline tax from three to four cents a gallon. A Rhode Island bill proposed an additional one-cent-a-gallon tax to raise funds for municipal road construction.

Present interest in increased gasoline taxes is an extension of a trend which last year saw such proposals introduced in some 19 states, with higher rates being enacted in four—Idaho, Iowa, Kansas and Oklahoma. The Kansas increase, from three to four cents a gallon, went into effect on March 1, this year, to raise

funds for secondary road construction. The other three 1945 enactments became effective last year. With gasoline tax receipts generally exceeding anticipations since the end of the war, to the extent that all-time high record collections are now expected in some states, the fiscal outlook in the states for postwar road construction has been brightening. Construction delays occasioned by the labor situation and other factors also have tended to permit additional accumulations of state highway funds. But, even though the states generally are able to start putting up their share of the $3,000,000,000 federal-state postwar highway construction program, a number still do not have revenues in sight for the full undertaking and for the additional construction planned in some instances.

Signs already are apparent that gasoline tax increases will be widely proposed next year, when some 45 state legislatures are scheduled to convene in regular session. Gov. Herbert B. Maw has expressed belief an increase in Utah's gasoline tax will eventually be necessary, with the Utah Highway Advisory Council having announced it would not oppose a jump from four to five cents in the rate if all automotive tax revenues were dedicated to highway use.

An increase of two cents a gallon in Colorado's gasoline tax rate is regarded as virtually certain to be sought during the 1947 Colorado legislative session. Such a measure was rejected by a special session in Colorado last fall, but some action will be necessary next year to provide further funds if the state is to participate fully in the federal-state highway construction program.

In California, a gasoline tax increase has been recommended by an interim legislative commission to finance an estimated $634,500,000 highway construction program, with the issue to come up next year unless raised at an earlier special legislative session. A one-cent increase in the Texas gas rate is expected to be urged during the 1947 Texas legislative session to finance an expanded farm-to-market road program.

The issue is expected to be revived in Connecticut, where both Gov. Raymond E. Baldwin and the state highway commission unsuccessfully sought passage of a one-cent increase last year.

Meanwhile the possibility of reduced gasoline tax rates is seen in some instances even though the trend appears to be in the other direction. It was recently reported that abolition of Oklahoma's 1945 extra two-cent gasoline tax is likely to be recommended by an interim state legislative tax revision study group. In South Dakota, highway users are planning a campaign for reduction of state's gas levy from four to three cents.

Demands for more stringent administration of laws providing for gasoline tax refunds to non-highway users may tend to lessen the need for more highway revenues in some instances. Designed to exempt from taxation the use of gasoline for farm machinery and other non-highway purposes, these laws have been loosely enforced in a number of states, with a resultant heavy drain of tax revenues.

About three-quarters of the states now provide refunds or exemptions of taxes on gasoline used for non-highway purposes. The list was broadened this year by new refund laws enacted by the legislatures of Kentucky and Georgia. Also, a recent South Carolina Supreme Court decision upheld the constitutionality of a 1945 law providing for gasoline tax rebates to farmers.

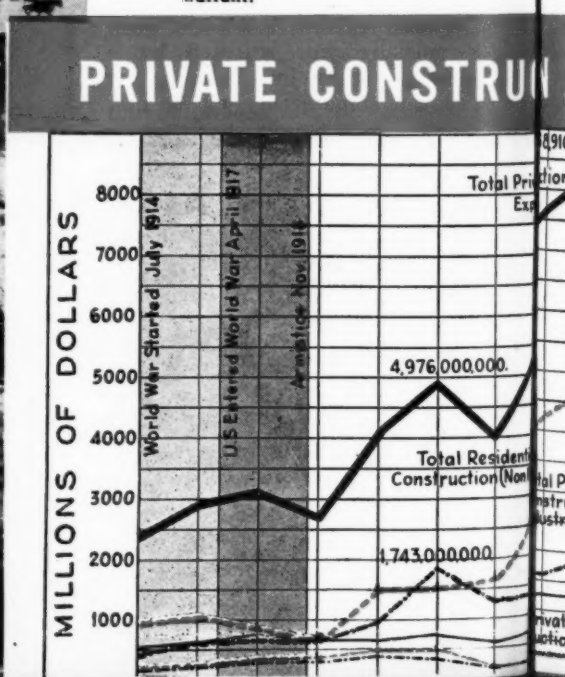
• Above: Bucyrus-Erie crane with ⅜-cu. yd. Blaw-Knox clamshell bucket is removing surplus material dug by a scraper in dressing side of U. S. 17 near Jacksonville, Fla. Below: This divided highway west of Milwaukee takes U. S. 18 and State Routes 19 and 30.

Postwar Housing

Starts with Excavation

ONE OF THE MOST serious domestic problems is providing enough homes for the Nation's people. To supply even the minimum number of dwelling units estimated to be required, residential building construction activity in the United States during the next ten years must be greater on the average than in the peak year of 1925, when about 937,000 units were completed.

• In numerous cities big projects are now under way to reduce prevailing acute housing shortages. One of these, on the outskirts of Miami, Fla., Arch Creek Acres, is a 240-acre tract of cut-over forest land. This International TD-18 tractor with Bucyrus-Erie Bullgrader is making quick work of deep-rooted palmettos and of rattlesnakes that infested the area. The Bullgrader covers four acres a nine-hour day. A recent survey shows that construction projects totalling more than $45,000,000 are definitely planned for the Miami area as soon as conditions warrant.

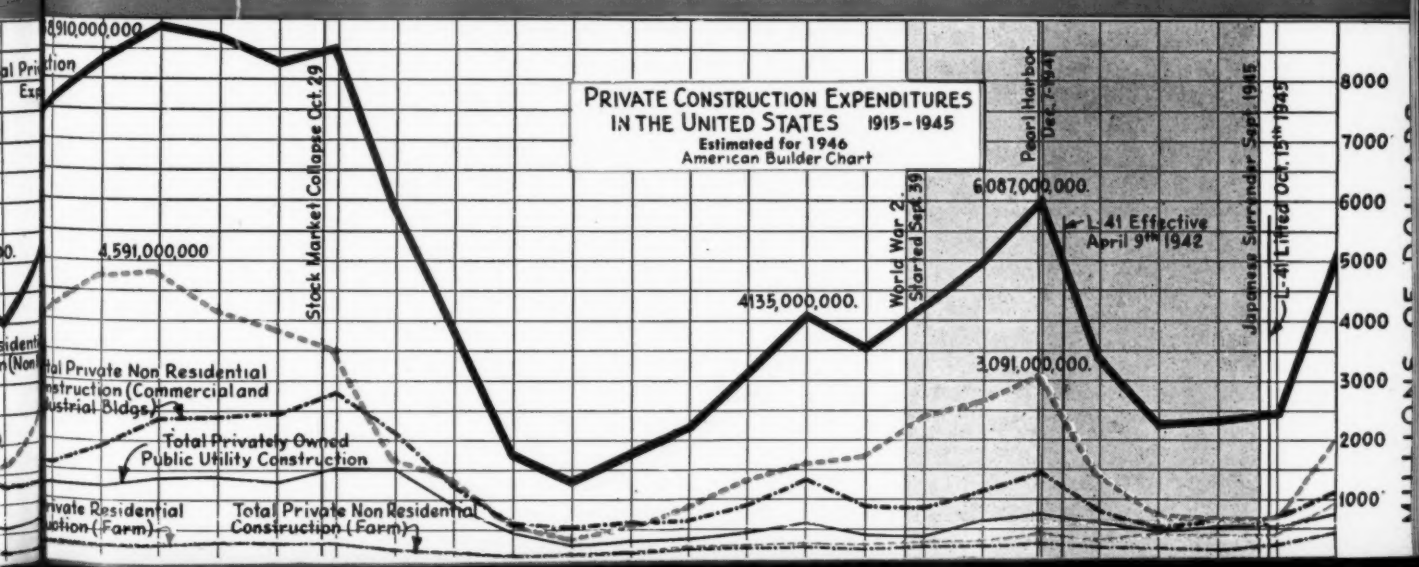


• **Above: Bullgrader on TD-14 tractor laying out streets for the Pine Forest Colored Subdivision, a 48-lot project on outskirts of Jacksonville, Fla. Above, Right: International I-6 tractor with White ⅜-cu. yd. front end cable loader is doing a quick job of basement excavation in Denver, Colorado. Right, lower: Bucyrus-Erie ¾-cu. yd. clamshell filling in for 40 seashore lots at Vineyard Haven, Mass.**

Estimates of the country's needs over the next decade, according to a study of housing made by The New York Trust Company and published in its quarterly publication, The Index, range from ten to 12.6 million dwelling units. Even if this program is accomplished it is claimed that a substantial portion of the Nation's housing facilities at the end of the period will be obsolete or substandard.

There were about 37,000,000 dwelling units in U. S. in 1940 and therefore from one-fourth to one-third as many homes as there were

RU . . . RESIDENTIAL and NON-RESIDENTIAL . . . 1915-1945



• A general trend to improvements of county and municipal roads and streets follows new housing. Shelby County, Tenn., meets the demand for local improvements by building roads. Above: Northwest dragline loads Caterpillar DW-10 tractors with W-10 wagons with gravel from pit at penal farm from where it is hauled 20 miles to Memphis, (Right) where it is dumped. Caterpillar motor grader is spreading windrows.

in the country at the outbreak of World War II will have to be built in the next ten years.

The scarcity of homes which developed early in the war period has been brought into even sharper relief by the plight of returning veterans unable to find a place to live. Among factors contributing to the housing shortage are decrease in new construction during the depression of the 1930s, the curb on building activity resulting from the outbreak of the war at a time when demand for new homes was increasing, the wartime shifts in population, and the increase in number of families in U. S. during the war. More than 15,000,000 people moved out of counties in which they were living in the war period. Most of these people were drawn to urban centers which soon became overcrowded from these population shifts. As a result, almost every center of war activity suffered a severe housing shortage.

Currently, attempts to solve the housing problem are complicated by shortages of building materials and labor, and by controversies over price controls. However, programs to relieve housing shortages in various localities have been started, as indicated by the pictures on these pages. New housing entails a great deal of excavating in addition to that needed for basements. New housing means sewers, water and public utility services, sidewalks, curbs and streets and roadways, all requiring "dirt moving."

The Federal Government has proposed a program whereby in the next two years 2.7 million homes would be built, with veterans having first call for these houses.

Inadequate Housing

The National Housing Agency recently estimated that 39% of the city housing in U. S. is below minimum health and safety requirements. Structural conditions in more than half of this substandard housing are termed a menace to health and safety. The Federal Public Housing Administration estimates that more than 16 million dwelling units would be required within the next ten years to replace all substandard units.

According to the 1940 census, about 46% of the then existing 37,000,000 dwelling units were in immediate need of major repairs or lacking in adequate sanitary facilities.

In addition to the effects of the depression on housing, the war period further increased the shortage, for there was virtually no residential construction in U. S. during World War II, except for a comparatively small number of housing units to accommodate war workers. Of the almost 15 million people who moved to urban centers during the war, some will return to their former homes, but others will desire better homes and many who had been living together during the depression and war years are now seeking homes of their own.

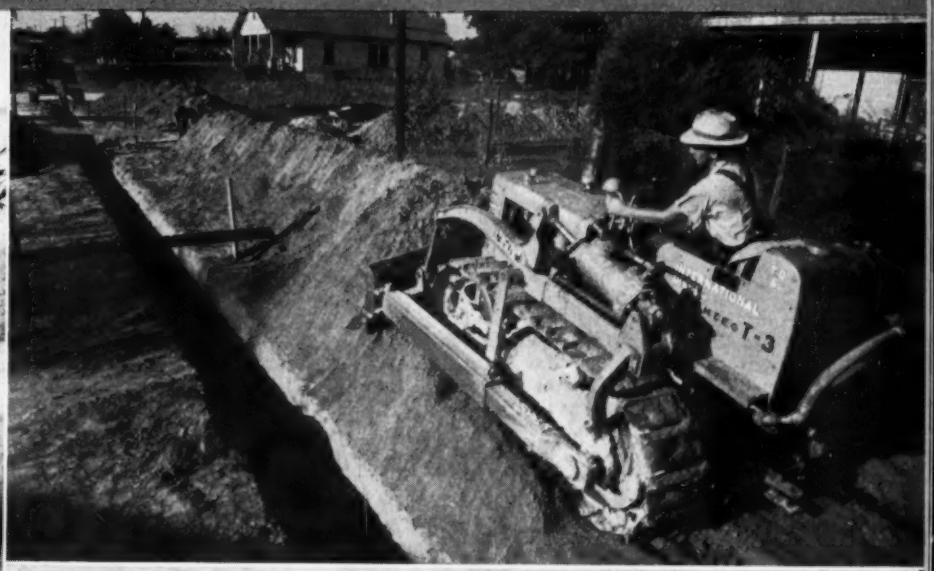
The Associated General Contractors of America, whose members perform the major portion of all types of construction executed by contractors throughout the United States, already has pledged its cooperation to the President in working toward the objectives of the Veterans' Emergency Housing Program of providing necessary homes, while the construction industry at the same time fulfills the other construction needs of the nation.

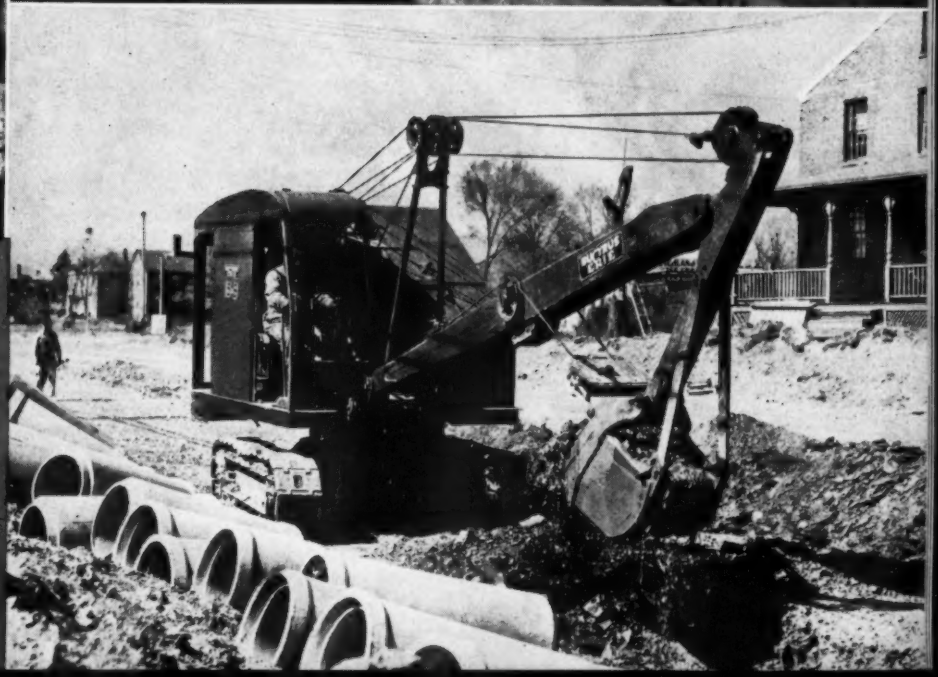
AGC Offers Help

The AGC has offered to the Housing Expeditor its knowledge of construction in helping to strike a balance between housing needs and the needs for all other essential types of construction necessary to create a high level of production and the maximum number of employment opportunities.

The Association contends that jobs for veterans are equally as important as homes for veterans. The AGC points out that practically every form of progress of the Nation—its social, economic, health and educational life—requires some form of construction.

• **Above:** Excavating basements for a row of houses for Property Sales Co. of Baltimore, Md., with a ¾-cu. yd. shovel owned by W. H. Cypull. **Below:** Along with new housing comes the need for sewers, water and public utility services, which means ditching and trenching and subsequent backfilling. Here a Bucyrus-Erie Bullgrader on International T-6 tractor backfills from 700 to 800 ft. of ditch averaging from six to eight feet per 10-hour day. Ditch is dug by dragshovel in background.





• **Above:** Bucyrus-Erie TD-14 Bullgrader clearing trees and cutting hills to fill for a new subdivision in Ohio. **Right:** This ½-cu. yd. dragshovel is used to dig sewer ditch, set concrete pipe and backfill in Connecticut.

Shots from the FIRING LINE

Bureau Gets 'Go Ahead' On Missouri Basin Plan

The "go ahead" signal to begin construction under its program for the full development of land, water, mineral, and hydroelectric power resources of the 1300-mile long Missouri River Valley has been given to the Bureau of Reclamation, Department of the Interior.

The signal was the authorization by Secretary J. A. Krug, of the award of a $4,688,000 contract for building the Kortes Dam and power plant on the North Platte River, 60 miles southwest of Casper, Wyoming. The contract was authorized for award to the Morrison-Knudsen Company, Inc., of Boise, Idaho, the lowest of four bidders. Work is scheduled to start within 30 days after the company is notified to proceed. Construction to complete the work under the contract is expected to take about three years.

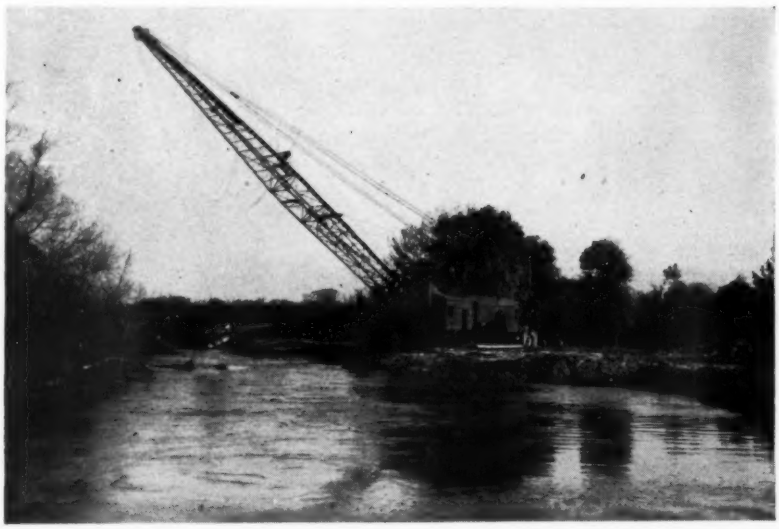
This will be the first Reclamation project to start construction in the joint two billion dollar Missouri Basin Plan, which has been inaugurated in conjunction with the Corps of Engineers, War Department.

The Missouri Basin Plan calls for basin-wide development of natural resources, flood control, and improvement of navigation, and includes projects to be built in Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Iowa, and Missouri. It envisages the construction of more than 100 new dams to create reservoirs that will hold more water than flows out of the mouth of the Missouri River in an entire year; 150 irrigation projects that will contain thousands of miles of canals and other facilities for creating 53,000 new farms from drouth-parched land; more than 20 power plants; safe water supplies for at least 19 communities; hundreds of miles of flood control dikes and levies, and 760 miles of uniform river channels for the promotion of low-cost navigation.

The Congress has authorized 29 projects for the construction of dams, power plants, irrigation works and other facilities under the Bureau of Reclamation's part of the program, but funds have been appropriated for construction of only three of them so far. These are the Kortes unit, the Angostura unit on the Cheyenne river, near Hot Springs, South Dakota, and the Boysen Dam unit on the Big Horn river, near Thermopolis, Wyoming. The Angostura unit provides for irrigating 16,000 acres of land, while the Boysen project will embrace both irrigation, power generation, flood control, and silt detention.

The Bureau of Reclamation is speeding a basin-wide program for making the scientific, economic and other investigations necessary to complete the planning of the remainder of the projects it expects to build under the Missouri River Basin Plan.

The Kortes Dam will be for the production of power only. It will be located two miles below the Seminoe Dam, completed by the Bureau of Reclamation in 1938, to provide irrigation water for 66,000 acres on the Kendrick project. Energy generated at the Kortes Dam will be used to help relieve a threatened power shortage in the area and for the development of coal, oil, and mineral resources. Located at the toe of the dam, the power plant will have a generating capacity of 36,000-kilowatts, provided by three 12,000-kilowatt generators. Contracts for generators and other electrical equipment, including a switchyard to be located on the roof of the powerhouse, are to be awarded later.



• Bucyrus-Monighan 200-W walking dragline, with 140-ft. boom with a 4-cu. yd. bucket, is used by Atlas Construction Co. of Waxahachie, Texas, to clean out a six-foot deep and 60-ft. wide canal for the USED on the Vermillion River in Louisiana. The job involves the excavation of 687,000 cu. yds. of clay.

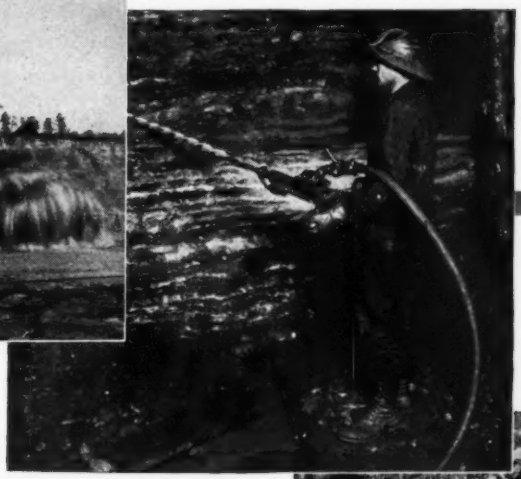
• Gun-play! This might well be the caption of this unusual photograph, but turn the page and look at the picture sideways and the mystery is solved. It was taken during experimental operations with asphaltic sealing material being conducted by the Bureau of Reclamation in one of the main canals of the Black Canyon Division of the Boise Project.

Bureau of Reclamation Photo

New Jersey Warned About Penalty for Diversion

Calling attention to a problem which also may arise in other states diverting automotive tax funds to non-highway purposes, New Jersey State Highway Commissioner Spencer Miller, Jr., warned that New Jersey faces the penalty of a $2,428,000 deduction in the road aid it receives from the federal government unless diversions of highway funds are halted during the 1946-47 fiscal year.

Commissioner Miller told the joint state legislative appropriations committee that on a basis of present calculations the diversions will total $7,358,000 for the fiscal period ending June 30, 1947. He said that if the diversions are made the Federal Bureau of Roads



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could penalize the state up to one-third of the amount diverted.

When Senator Herbert J. Pascoe, appropriations committee chairman, noted that the state had been penalized only once in past for such diversions, Miller said it was highly probable the penalty feature would be enforced in the future under the enlarged federal aid highway construction program.

Miller said he had been successful in convincing Federal Roads Administrator McDonald that only current diversions should be considered in calculating the penalties although he felt it might be imposed under the federal law for past diversions.

New Jersey is eligible next year for more than $9,000,000 in federal aid compared with amounts ranging between $1,500,000 and $2,000,000 in the past. Miller said it is now the policy of the Federal Roads Bureau to see that the aid goes in full only to those states which spend all of their highway revenues—motor fuel taxes and motor vehicle license receipts—on highway construction, maintenance, bridges, lighting and policing.

Miller said McDonald had promised him he would await action of the New Jersey Legislature before deciding whether a penalty should be imposed and how much it should be.

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Utah Approves Postwar Road Budget for First Year

Utah's State Road Commission approved the state's first postwar road budget, calling for expenditure of $5,193,079, exclusive of federal matching funds.

Based on an estimated revenue of $4,500,000 during 1946 from gas and motor vehicle taxes and a war-built reserve, the budget provides $1,973,308 to match approximately $5,500,000 in federal funds.

Chief Engineer Roy W. McLeese said the 1946 budget represents an increase of $2,196,500 over that of 1945, but pointed out that the 1945 budget provided no matching funds for federal aid, which was discontinued during the war.

Idaho Authorizes Notes for Highway Revenue

Issuance of $500,000 in tax anticipation notes to add revenue to the highway department was authorized by a special session of the Idaho Legislature.

Gov. Arnold Williams had appealed for additional funds for the highway department to meet "an urgent need for the repair of portions of the present highway system which have during the war years been given little if any maintenance and repair due to the labor shortage." Besides maintenance and repair, he said money was needed to purchase new highway equipment.

During debate on the bill, it was indicated that increased automotive taxes will be sought during the 1947 regular session of the Idaho Legislature.

Constitutionality of Montana's Debenture Act Upheld

Constitutionality of Montana's 1945 highway debenture act, authorizing the State Highway Commission to issue $12,000,000 in treasury debenture bonds for postwar highway construction and improvement, was unanimously upheld by the Montana Supreme Court.

"We find no reason for condemning the act in question, or for restraining the issuance and sale of the debentures of the collection of taxes," the high state tribunal declared in an opinion prepared by Chief Justice Howard A. Johnson and concurred in by Associate Justices Claude F. Morris, Hugh R. Adair, Albert H. Angstman and Edwin K. Cheadle.

The opinion cleared the way for provision of Montana's share in the more than $40,000,000 postwar federal-aid program for construction and improvement of some 1,800 miles of highway in the state in the next three years.

In attacking the act's validity, Pioneer Motors, Inc., and Ford Johnson, both of Helena, had set forth 22 separate contentions of invalidity and unconstitutionality and asked the high

(Continued on page 254)

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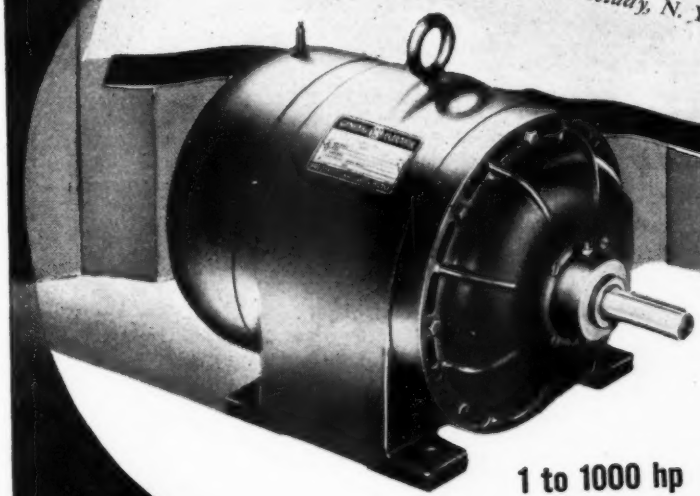

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• Harold Youngman of Baxter Springs, Kansas, uses Pioneer Quarry Plant to crush one of the hardest and most abrasive rocks in the world. When Youngman made application to the Mining Section of the War Production Board for crushing equipment, he was advised that these rocks were the most abrasive known in U. S., and equalled only by one known rock deposit in the world, located in South Africa. His Pioneer plant includes a 56 primary unit, with traveling grizzly feeder and a 2436 jaw crusher, and a Pioneer 48-V crushing and screening plant, including a 1036 jaw crusher and a 40" x 22" roll crusher.

Shots from the Firing Line

(Continued from page 250)

state court to declare the statute invalid and grant a permanent injunction against its effectiveness.

The plaintiffs contended, among other things, that state gasoline taxes would be increased from 5 to 10 or more cents a gallon and that such an increase would be "excessive, unreasonable, confiscatory and oppressive."

Asserting that gasoline taxes would not be increased, the court pointed out in its opinion that the act called for repeal of the present tax as soon as outstanding bonds were repaid, and after that, a new 5-cent-per-gallon tax would be imposed to repay new bond issues.

The plaintiffs also had contended that the act was unconstitutional because non-taxpaying voters were not permitted to vote in the special election last June which approved the $12,000,000 bond issue. The court answered that "if the question concerns creation of any levy, debt or liability," the state constitution provides that the voter must be a taxpayer.

Twenty other contentions of invalidity were all answered in the 18-page court opinion, and the requested writ of injunction was denied.

Listed as defendants in the suit were the State Highway Commission, the State Board of Equalization, Gov. Sam Ford, State Treasurer George P. Porter, Secretary of State Sam W. Mitchell, State Auditor John J. Holmes and Attorney General R. V. Bottomly.

Ten Million Yards Involved In Horsetooth Project

Almost 10,000,000 cu. yds. of earth and rockfill will be required for the construction of Horsetooth Reservoir on the Colorado-Big Thompson project, it was revealed when a call for bids was

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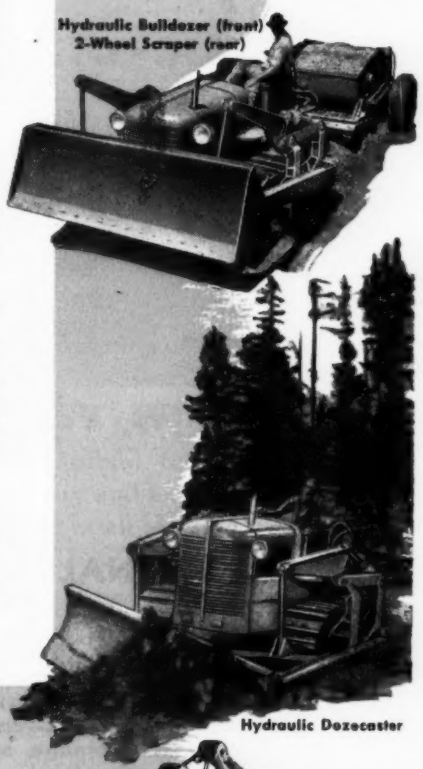

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announced by the Chief Engineer's office of the Bureau of Reclamation at Denver. The bids were opened in Denver on May 6.

Horsetooth Reservoir will be the first reservoir to be constructed for the Colorado-Big Thompson development on the eastern side of the Continental Divide. The reservoir will be located about five miles southwest of Fort Collins, Colo., between two parallel hogbacks. It will serve to store water diverted from the western slope through the 13-mile-long Alva B. Adams tunnel for supplemental irrigation of lands in northeastern Colorado.

Plans call for the construction of four dams and one dike which will create a reservoir with an active storage capacity of 134,000 acre-feet of water. The four dams required for the reservoir and their structural heights are: Horsetooth, 120 feet; Soldier Canyon, 200 feet; Dixon Canyon, 220 feet; and Spring Canyon, 200 feet. The combined crest length of the dams will total approximately 5,400 feet.

The outlet works will consist of a conduit at Horsetooth Dam and a tunnel at Dixon Dam for the release of water for irrigation purposes.

State Court Rules Against Contractors in Kansas

An opinion handed down by the Kansas Supreme Court held that contractors who had been awarded jobs by the State Highway Commission and were working on the projects when World War II began, would have to complete the projects under their contracts.

The ruling affected 27 contracts amounting to $1,656,555.06. Some of the contracts were barely under way when the war began and others were up to 90 per cent completed. The others were at varying stages between beginning and completion.

Thirteen contractors, 12 from Kansas and one from Missouri, were involved in the litigation. Bringing suits asking that the contracts be cancelled, the contractors contended that the work could not be finished at the prewar prices under which the contracts were awarded. The state contended that the contractors could not use the doctrine of legal frustration to escape fulfilling the contracts.

The contractors whose separate suits were consolidated, were:

F. H. Freeto, Pittsburg, Neosho County, two bridges, $46,050; C. A. Tucker and C. J. McCoy, Emporia, paving in Kingman County, $80,392; Harry J. Taylor, Salina, paving near Chase and Lyons in Rice County, $56,063; Rhoades Construction Company, Newton, two bridges in Wabaunsee County and one in Kingman County, $147,561; Charles Hulme, Great Bend, surfacing near Barton-Rush county line, $97,700; Lloyd K. Jones, Emporia, grading near Osawatomie and in Lyon County, $315,415; E. W. Geiger, Leavenworth, three bridges in Miami County, $146,959; Sarah H. Cook, Ottawa, and Tucker & McCoy, Emporia, grading and paving on Woodson-Allen county line, $121,299; List & Clark Construction Company, Kansas City, Mo., grading near Concordia, $100,331; Grant A. Stannard and Otis McGeorge, Wichita, paving near Concordia, $142,722; D. G. Hansen, Logan, bridge in Pottawatomie County, $30,632; George Bennett, Kansas City, Kansas, grading and culverts in Wabaunsee County, $287,274; S. H. Reno, Merriam, surfacing near Abilene, $76,146.

Highways to Play Part in Reducing Housing Shortage

Highway construction will complement—not interfere—with the National Housing Administration's objective of 2,700,000 homes for veterans by 1947, according to Charles M. Upham, engineer-director of the American Road Builders' Association.

"Highways are a vital economic necessity, and failure to provide these new homes and new communities with adequate roads and streets would be a serious mistake," Upham declared.

"Housing, sorely as it is needed now, is not the only postwar problem, and the sensible attitude taken by government agencies toward road building, reclamation, flood control and such essentials is to be commended," said Upham. "Road building has been sadly neglected for more than four years. It

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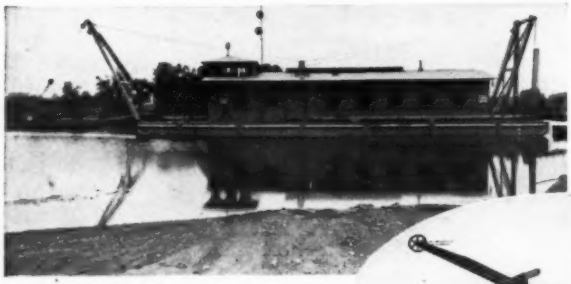

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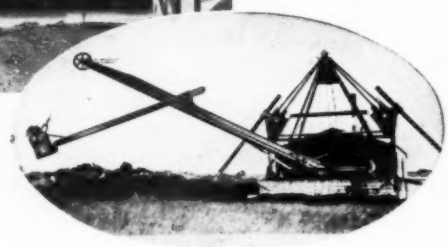

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cannot be further postponed. To permit our highways to get any worse would be to disrupt the nation's transportation system. We must have new roads and we must repair the old at once.

"Fortunately studies of critical building materials show no conflict between highway building and housing," the engineer-director pointed out. "Unglazed brick, structural insulation board, gypsum board, structural clay tile and lumber, exclusive of millwork and flooring, needed by housing in vast quantities are scarcely noted in road building requirements."

Road building is directly beneficial to veterans as a source of employment, the statement continues. It is estimated that a million men are needed for on-site jobs and as many more in the production of road building equipment and materials. Moreover this construction work is widely distributed throughout the country.

While certain construction must be deferred in favor of the veterans' housing project, Upham calls attention to the fact that a minimum of 12 per cent of the national income depends on construction. Highway building plus the emergency construction made necessary by the lack of homes will go far toward maintaining this ratio, he concludes.

Guterbuth President of Kentucky Road Group

C. H. Guterbuth of Louisville was elected president of the Kentucky Association of Highway Contractors. Fount Crow, Beaver Dam, was elected first vice-president; G. D. Davies, Erlanger, second vice-president, and W. P. Humble, Frankfort, executive secretary.

Directors named were: H. C. Adams, Lexington; George H. Cheek, Frankfort; J. C. Codell, Winchester; W. E. Lehman, Lexington; E. P. Moynahan, Louisville; H. D. Strunk, Somerset, and Graham Webb, Ashland.

Flood Control Work Resumed In Southwest Area

Temporarily suspended by the war emergency, flood control projects in the Southwest are again under construction, the office of the Southwestern Division Engineer announced.

When stripping and excavation got under way at the Canton Dam project on the North Canadian River above Oklahoma City, Oklahoma, it marked the resumption of work on the U. S. Engineer construction program for flood control throughout the southwestern United States. Four projects in Oklahoma; two in Arkansas; one in Colorado; one in Kansas; one in Missouri; and two projects in Texas, making a total of 11 water control construction projects, are under way, or will begin imminently. More than two years will

(Continued on page 260)

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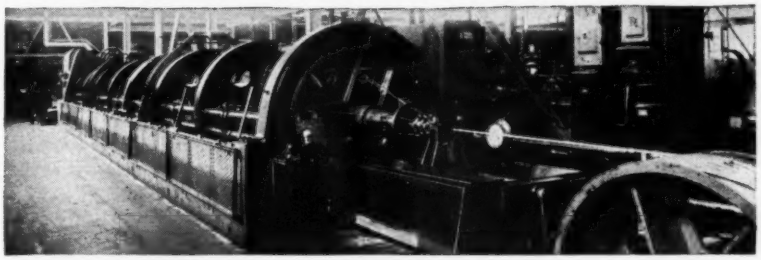

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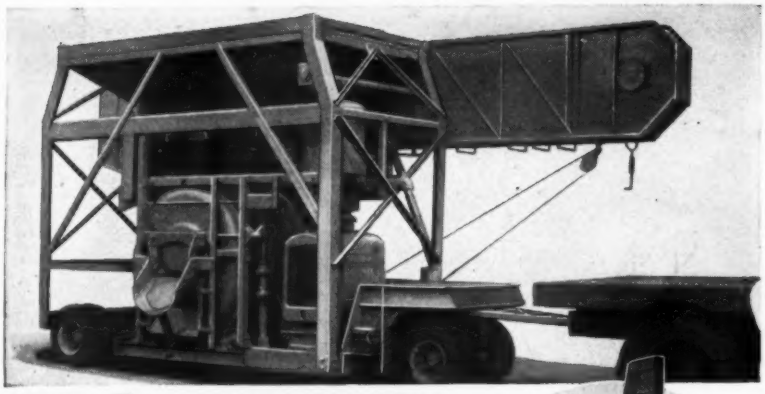

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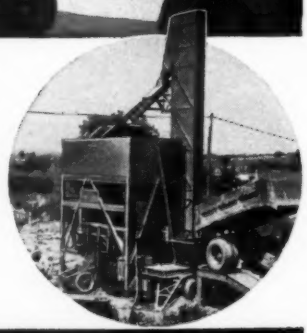

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(Continued from page 257)

be required to complete the construction of the work contracted thus far.

All projects are undertaken by the Southwestern Division of the Corps of Engineers. In addition to the Canton Dam they include: Wister Dam and Reservoir on the Poteau River near the Oklahoma-Arkansas state boundary; the Fort Gibson Dam and Reservoir on the Grand (Neosho) River near Muskogee, Oklahoma; the Hulah Dam and Reservoir on the Caney River near the Oklahoma-Kansas state boundary; completion of the existing John Martin Dam and Reservoir on the Arkansas River near Las Animas, Colorado by the installation of spillway gates; the Blue Mountain Dam and Reservoir on the Petit Jean River west of Little Rock, Arkansas; the Bull Shoals Dam and Reservoir on the White River near the Arkansas-Missouri state boundary; the Clearwater Dam and Reservoir on the Black River in southeast Missouri; the Fall River Dam and Reservoir on a major tributary of the Verdigris River in Kansas; the Addicks Dam on Buffalo Bayou in Texas; and the completion of riprap protection to the existing Denison Dam near Denison, Texas.

Each of the projects is a unit in the comprehensive plan for development of flood control on major watersheds in the Southwestern Division. Although primarily designed for flood control, many of the works are planned for multiple purposes such as production of hydroelectric power, navigation, irrigation, abatement of pollution, industrial and domestic water supply, recreation, and conservation of wildlife.

The 11 projects now under way are the first of a score of other flood control projects which are in the advance planning stage, authorized by Congress, and awaiting initiation of construction as funds are made available.

Canton Contract

The Canton contract, for construction of a dam and spillway, was awarded to C. F. Lytle Construction Company and the Amis Construction Company. This is a $5,192,623 undertaking and will be completed in two years. Work on Canton Dam was 25 per cent completed when it was placed in a stand-by status at the beginning of the war. When completed, the dam will create a reservoir with a total storage capacity of 390,000 acre-feet of water and will cover an approximate area of 15,500 acres. The dam will be 14,300 feet long, 32 feet wide at the crest, and 68 feet above the valley floor.

The Wister project structures consist primarily of a rolled-fill earth embankment, an uncontrolled chute-type spillway, and outlet works consisting of a conduit, gate tower, gates, and appurtenant facilities. The reservoir created by a 13,100 foot long embankment with a height at its crest of 68 feet will cover 35,800 acres at maximum pool elevation. The normal, or conservation pool will contain 30,000 acre-feet of water and will inundate 4,000 acres. Groves, Lundin and Cox has been

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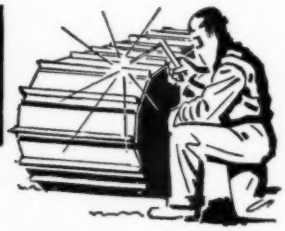

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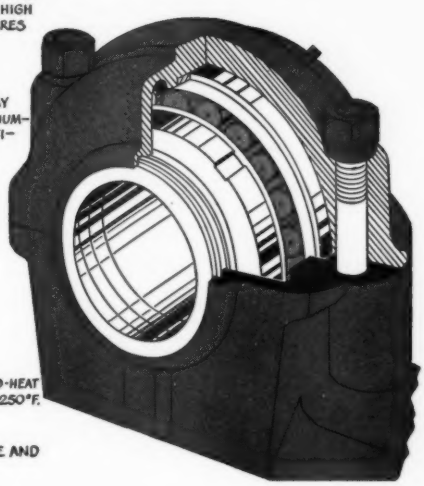
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Developed especially for bearings that must operate in radiated heat, new Calol S. A. (sodium aluminum) Grease has proved satisfactory in temperatures over 250° F. It has been tested by many operators on working machines in the field. In addition, it was given a series of tests in the Navy Ball Bearing Machine, operated at 10,000 rpm, with bearing temperatures maintained at a high degree.

Calol S. A. Grease is made from a special type base and selected oils that give it high heat-resistant qualities. In use, these qualities assure minimum drippage or leakage from bearings.

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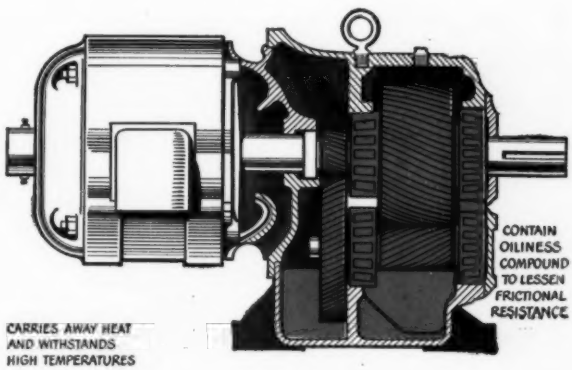

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awarded a contract for $4,016,727 for construction of this dam, the construction period being 800 days.

Fort Gibson Project

The Fort Gibson project, for flood control and hyroelectric power production, consists of a concrete dam 2,850 feet long with its crest 110 feet above the stream bed. At elevation 582 feet above sea level, top of the flood-control pool, the reservoir will have a total storage capacity of 1,287,000 acre-feet. This capacity will be divided into 922,000 acre-feet for flood control and 365,000 acre-feet for power storage. Contract for construction of this project is expected to be awarded soon. The power plant for the project will be constructed under a separate contract at a later date.

Hulah Dam

Construction of the Hulah Dam has been divided into two phases. The initial contract, which will be let shortly, calls for partial construction of the 5,200-foot earth-fill dam and excavation for the concrete spillway structure. After a consolidation period, the dam will be completed to the 777-foot elevation, and the concrete spillway constructed by a separate contract. The top of the spillway gates will be at elevation 765 feet and at that level the reservoir will cover 13,000 acres and will have a capacity of 295,000 acre-feet. Normally, the conservation pool will be kept at the 725-foot contour, inundating 1,900 acres, and will contain 15,000 acre-feet of water.

Blue Mountain Dam

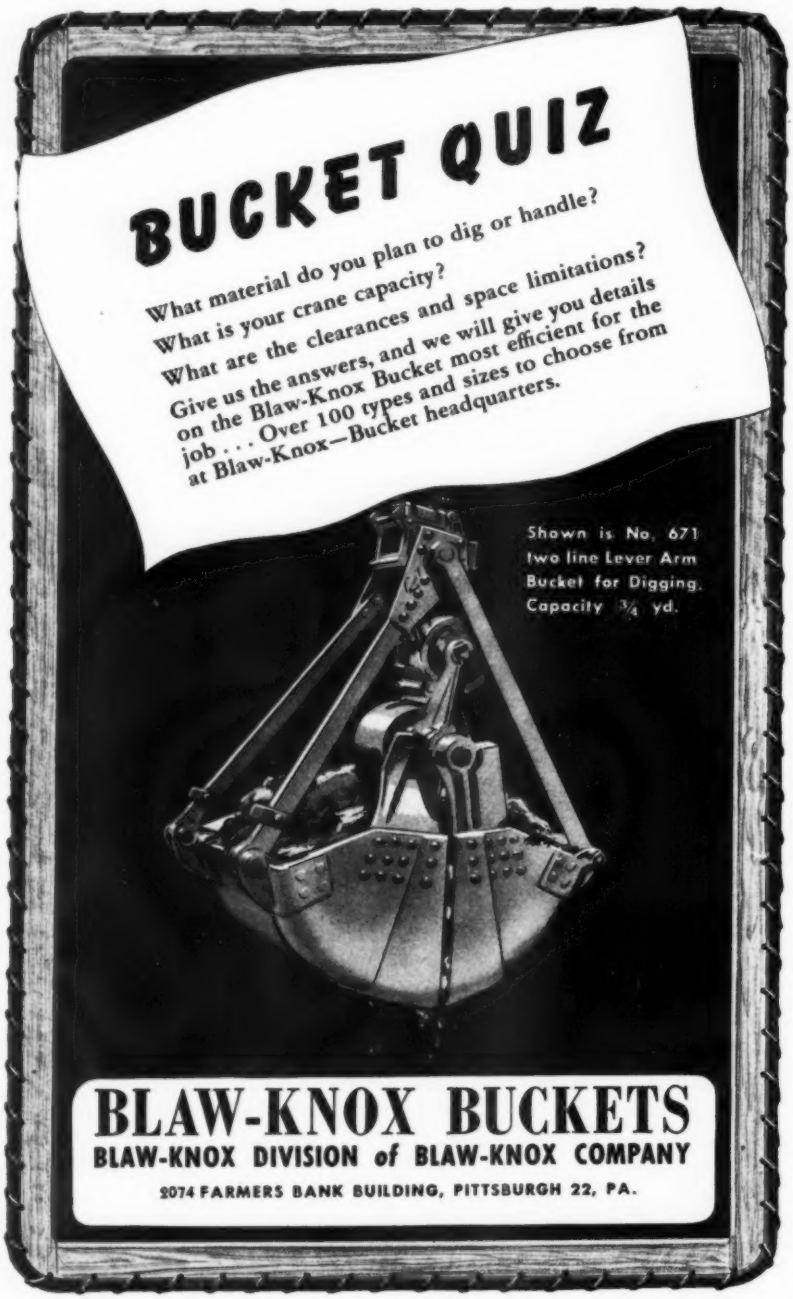
In the Arkansas River basin, the Blue Mountain dam on the Petit Jean River will control the run-off from a drainage area of about 500 square miles. Project structures will consist of a saddle spillway in the left abutment, a rolled earth-fill dam, and a tunneled outlet works in the right abutment. The dam will have a height of 82 feet above the flood plain and its over-all length will be 2,800 feet. The reservoir will have a total storage capacity of 258,000 acre-feet at spillway crest level. Of this amount, a permanent conservation pool will contain 25,000 acre-feet. The S. E. Evans Construction Company has been awarded a million-dollar contract for the completion of this project.

For both flood control and hydroelectric power, the Bull Shoals Dam will provide a large reservoir for recreation and wildlife as well as benefits to navigation. The dam will be a concrete structure, an overflow spillway will be located on the right side of the flood plain, and the non-overflow section on the left. Flows will be regulated by radial crest gates. Contracts to cover facilities, such as access roads and office buildings, to serve the construction requirements of the main dam have been awarded, or will be let shortly.

Mittry Brothers has been awarded a contract in the amount of $3,415,000 for completion of the dam and spillway at the Clearwater project. The 143-foot high dam will have a crest length of 4,225 feet; will impound 22,000 acre-feet of water in a conservation pool. The flood control pool will provide a storage capacity of 391,000 acre-feet above the conservation pool level.

The Addicks Dam is a part of the plan for the protection of Houston, Texas, and the Houston Ship Channel. In conjunction with Barker Dam, which was completed in 1943, it will control flood waters in the upper part of the Buffalo Bayou basin. The reservoir will be operated for flood control only. The embankment, an earth-fill structure, will be over eleven miles long, with a maximum height of 48.5 feet.

The Fall River Dam in Kansas will be of rolled earth construction with a concrete spillway and outlet works, and a masonry service building. No provision is made for hydroelectric power generation. It will be located in Greenwood County, Kansas, about four miles northwest of Fall River.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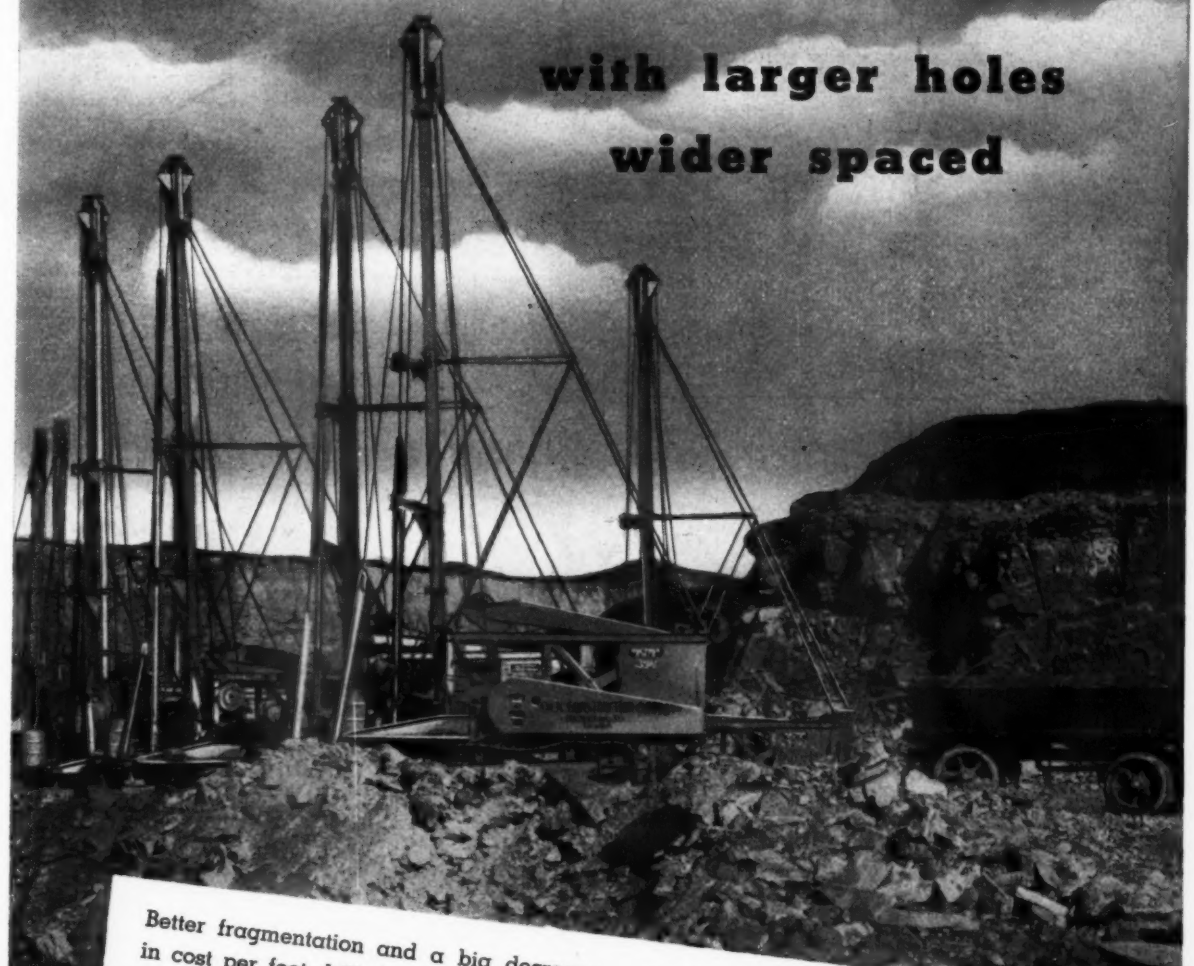

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Builders Association at its eighteenth annual meeting in Detroit. Also elected were: Vice presidents, L. W. Lamb of Holland and I. L. Whitehead of Sault Ste. Marie, Upper Peninsula; and secretary-treasurer, H. L. Fry of Lansing. Walter Toebe of Lansing was reappointed executive secretary.

Additional Ohio Program

A $5,000,000 1946 road construction program, separate from the postwar Federal-aid programs, and which will include 88 projects in 58 counties, was announced by Ohio State Highway Director Perry T. Ford.

The program, to be financed by gasoline tax funds, will be under contract by July 1, Director Ford said, unless labor and material difficulties interfere. The projects include resurfacing, widening and relocating roads and bridge construction.

Award Four Highway Contracts in Kentucky

Four major highway building projects totaling $523,541.14 in Breckinridge, Hardin, Hopkins, Knox and Meade counties were awarded by J. Stephen Watkins, Commissioner of the Kentucky Department of Highways. Thus far in 1946, 32 definite awards have been made which will cost a total of $5,125,936.20 in 33 Kentucky counties.

Contracts awarded thus far this year will give Kentucky 225 more miles of surfaced highways, according to Watkins. He said that five new bridges and one grade separation are under contract.

New Construction Continues Upward Trend in March

New construction, continuing its upward trend, was valued at $612 million in March, the Construction Division, Department of Commerce announced.

The March volume of construction represented an increase of nearly 17 percent over February and 95 percent over March, 1945. All types of construction showed increases in March, 1946, as compared with the previous month.

Privately financed residential construction (exclusive of farm buildings, trailers, and conversions) rose nearly 12 percent from the February level to $188 million in March.

The volume of private nonresidential building in March increased 8.5 percent over February. Privately financed public utility activity, which had declined slightly in February compared with January, recovered in March and was about 18 percent over February.

Privately financed construction of all types in March totaled $497 million, an increase of 12.2 percent over February.

Publicly financed construction rose 42 percent from the February volume to $115 million in March. This gain largely reflected normal seasonal expansion, the Construction Division pointed out.

Authorize Further Contracts On Friant-Kern Canal

Speeding work on the 156-mile Friant-Kern Canal (California), the third construction contract within a month has been authorized for this vital waterway of the Central Valley Rec-

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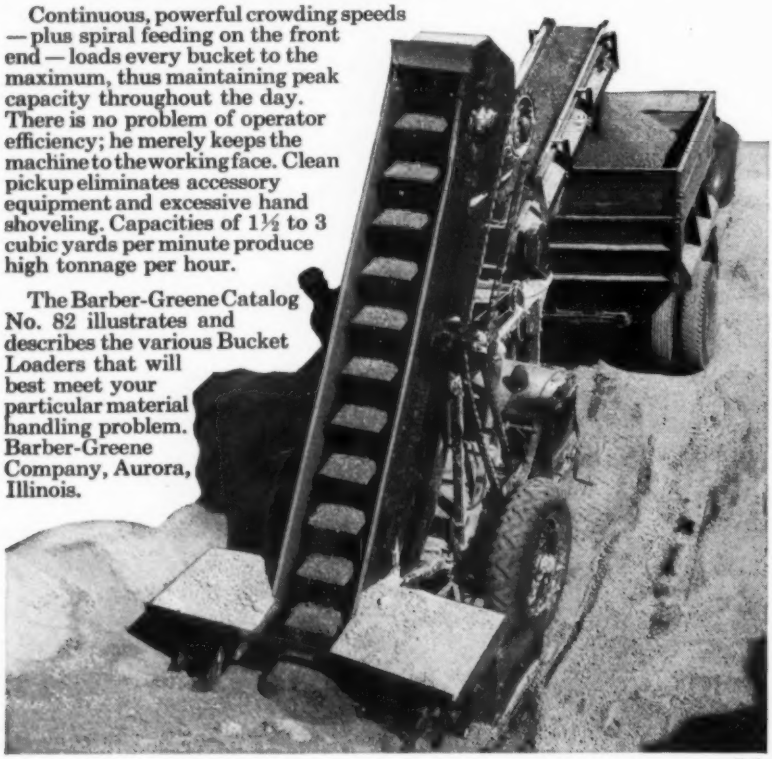
The Barber-Greene Catalog No. 82 illustrates and describes the various Bucket Loaders that will best meet your particular material handling problem. Barber-Greene Company, Aurora, Illinois.



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That means more time to put to work really outstanding digging ability — the result of design that combines the best performance features developed in Bucyrus-Erie's long experience in manufacturing excavators. Quickly convertible in the field, Bucyrus-Eries are equally effective as shovels, draglines, clamshells, or cranes.

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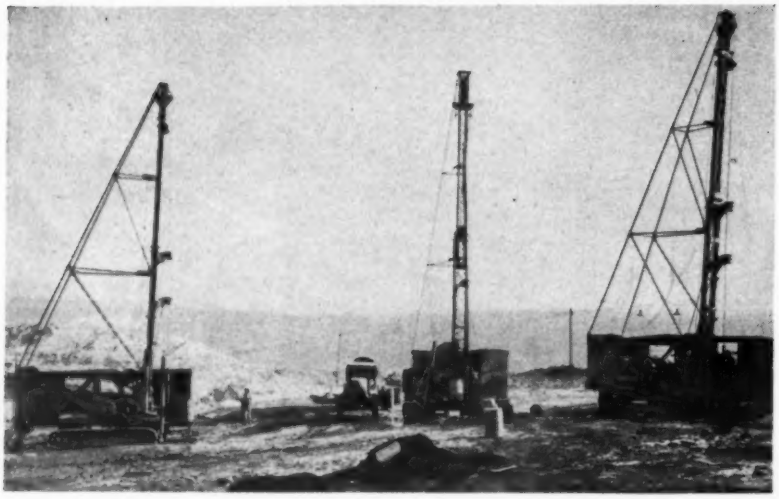

• Corey, Baxter & Kennedy, Inc., of New York City uses three Bucyrus-Erie 42-T drills, two electric and one diesel (center) to drill nine-inch blast holes for Lehigh Navigation Coal Co. on an anthracite coal strip mining operation near Tamaqua, Pa. The average output of the drills is up to 70 ft. per seven-hour shift and the maximum output is 90 ft. per seven-hour shift. About 41,000,000 cu. yds. is involved in the job.

lamation Project, Secretary of the Interior J. A. Krug announced.

The Secretary said that Peter Kiewit Sons Company of Omaha, now building the first 21 miles of the canal, was the successful low bidder with the amount of $1,598,856 for an additional 8½-mile section, extending the canal to Kings River.

When the canal is completed it will extend from Millerton Lake, the reservoir created by Friant Dam, south to the Kern River near Bakersfield, California. This artificial waterway has been designed by Bureau of Reclamation engineers to irrigate almost 1,000,000 acres of water-deficient lands in the fertile San Joaquin River valley.

According to Commissioner of Reclamation Michael W. Straus, two other important Friant-Kern contracts authorized within the past month were: a $3,377,605-contract to the Kiewit Company for building a 16-mile section of the canal between the San Joaquin and Kings River, and a $267,805-contract to Bechtel Brothers-McCone Company of San Francisco for constructing the Little Dry Creek siphon and wasteway on the canal. The latter contract also covers building a concrete wasteway containing two 16′ by 17′ radial gates.

Commissioner Straus said that two additional construction contracts for the Friant-Kern Canal will be announced soon: to build an additional 42-mile section of the canal extending from 18 miles east of Fresno to 10 miles east of Visalia and to construct the Kings River wasteway and siphon, including approximately one mile of the adjoining canal.

Fluor Construction Co. Given AGC Safety Award

The Fluor Corporation, Ltd., Los Angeles, was awarded second place in the Heavy Construction Division of the 1945 Accident Prevention Contest sponsored by the Associated General Contractors of America. This award was made at the national convention of the association, which was held in Chicago.

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record, The Fluor Corporation had a .64 severity rate for 4,683,162 man-hours of exposure.

Ohio Hopes to Start Road Construction by Summer

The Ohio State Highway Department hopes to start actual construction work on the first post-war year's Federal aid highway program and Federal aid urban program by the middle of this coming summer, providing economic conditions are stabilized, Highway Director Perry T. Ford said.

There are 32 projects on the Ohio Federal aid highway program and 15 projects on the Federal aid urban program which have been approved by the Public Roads Administration for the state's first post-war year highway improvement program.

Approval of expenditure of $268,180, including $113,090 of Federal funds, for continuation during the first post-war year of the state-wide highway planning survey and research also was revealed by Director Ford.

The Federal Highway Act of 1944 authorized an annual $500,000,000 appropriation for distribution to the states annually for the first three post-war years, this to be matched 50-50 by the states. The act provides that $225,000,000 be spent annually for Federal primary routes, $150,000,000 for secondary roads and $125,000,000 for urban roads. Ohio's allotment for each of the three years is: Federal system, $7,904,000; secondary roads, $4,658,000, and urban highways, $7,540,000.

House Bill 477, passed by the state Legislature last year, provided funds for state and county participation in the program for the first year. Twenty-five thousand dollars for each county, or a total of $2,200,000, was appropriated for the counties, and an equal sum as the state's share.

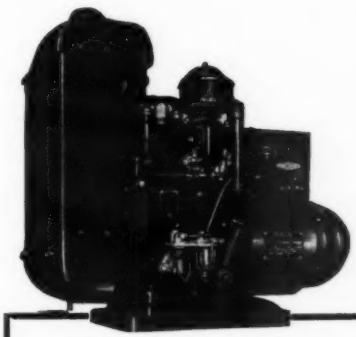
Start Drilling Work on Channel Deepening Project

Foundation investigation drillings to determine location of dam sites were started on the proposed $13,000,000 channel deepening project on the Columbus Apalachicola navigation route at the confluence of the Chattahoochee and Flint rivers just west of Recovery, Georgia. The project aims to deepen the channel to nine feet and construct two large dams.

Col. Mark Boatner, commanding officer of the Mobile, Ala., office of the U. S. Engineers, is in charge of the work.

Karaganda Coal Field Development in U.S.S.R.

The Karaganda coal fields in the central part of the Kazakh Soviet Socialist Republic, which prior to 1917 consisted of one small pit, is now the Soviet Union's third largest producer of coal.



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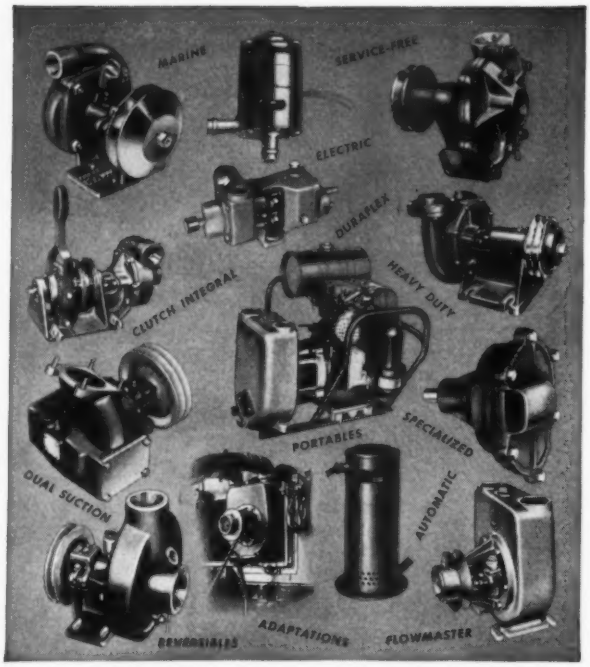

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Before development of the Karaganda fields, coal was sent from the Kuznetsk Basin to the Urals and iron ore was carried by the trains on the return trip. This long haul placed a strain on the Trans-Siberian main line. Now, with the extensive working of the Karaganda fields, a railroad has been constructed from Stalinsk westward to Magnitorsk in the Urals. This railroad passes close to Karaganda and enables coal to be shipped to the Urals over a shorter, more direct route.

Development of Karaganda was fast and by 1938, the latest available production figures, 4,150,000 metric tons were produced in that year. The city grew from the equivalent of an American "whistle-stop" to a population of 166,000 in 1939. During the war years, intensive mining with complete mechanization, greatly increased the population. Twenty-eight years ago there was no school above a primary level in all Kazakhstan. Today in Karaganda alone there are over 1,000 students in a single mining college.

During World War II, magnetite deposits of high grade iron ore were found near Karaganda.

Kansas Governor Reappoints Three Road Commissioners

Gov. Andrew F. Schoeppel of Kansas announced the reappointment for a two-year term of three members of the Kansas Highway Commission. Those reappointed were: Harold K. Snider, Lawrence; Charles L. Cushing, Downs; and Kirke Dale, Arkansas City.

Davis Dam Contract to Utah Construction Co.

The Utah Construction Company, San Francisco, was recently awarded a $21,462,505 construction contract for Davis Dam in Arizona, fourth of the great structures designed by the Bureau of Reclamation for regulation of the Colorado River.

Davis Dam, to be located in Pyramid Canyon, will be the largest construction project undertaken by the Bureau in the Southwest since Boulder Dam was built 64 miles upstream. Total cost of the Davis Dam project is estimated at $77,000,000. The dam will be an earth and rockfill structure.

Announce Expansion of Highway Research Board

The Executive Committee of the Highway Research Board announces that the work of the Board is being enlarged to provide a greatly expanded Highway Research Correlation Service.

In the post war billion dollar annual program of highway improvement already provided for by the Congress and the States, the need for research is recognized. The Federal-Aid Highway Act of 1944 provides for "engineering and economic investigations and highway research necessary in connection therewith."

The Executive Committee states that, to meet more adequately the imperative need for correlation and coordination of the work of the many research agencies, the Highway Research Board, which is an operating unit of the National Research Council, cooperating with the Public Roads Administration and the state highway departments, will greatly expand its facilities by employment of field engi-

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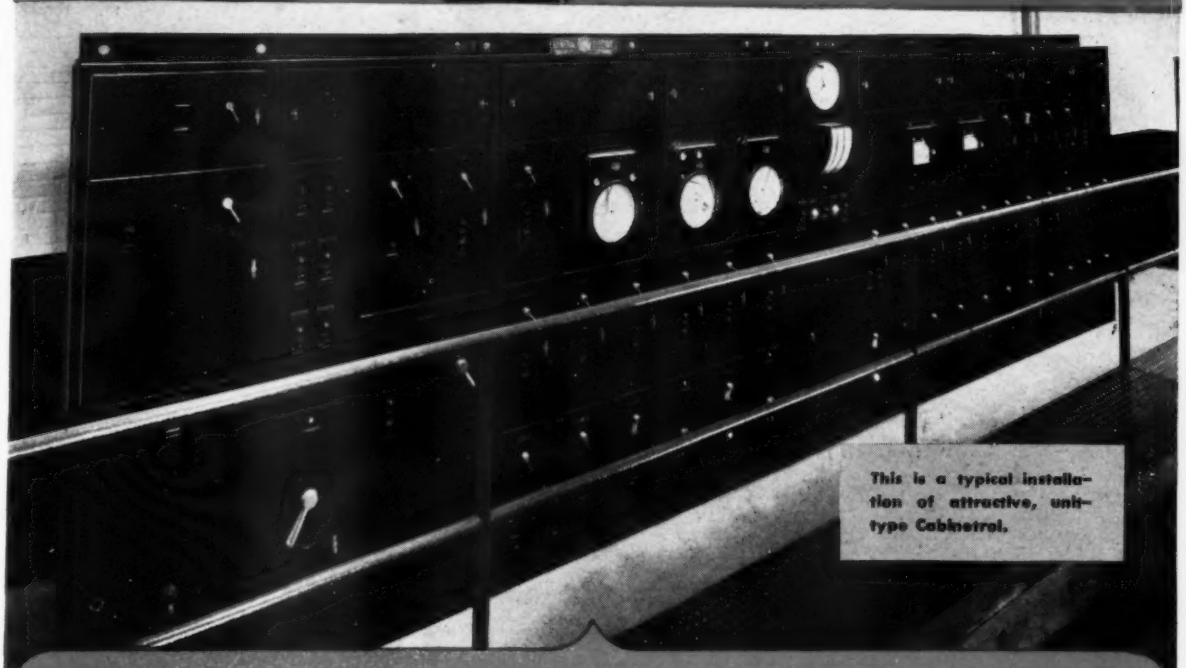

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Cabinetrol is based on the use of standard enclosures equipped with the right combination of standard control devices. Each unit is pre-engineered to meet your specific requirements. All starters and accessory equipment necessary to your application are incorporated in the Cabinetrol unit before it is shipped.

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If you'd like more facts about Cabinetrol ask for Bulletin GEA-3856. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

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• Building a logging road near Mendocino, Calif., this Caterpillar D7 tractor with Caterpillar pilot model bulldozer is working in heavy clay, rocks and boulders. The 25-mile road has a 7% grade.

neers and by provision for greater support of committee work and publications. Engineers of the Board will spend a considerable part of their time visiting the state highway departments and other research agencies in order to acquire comprehensive knowledge of current or past research in their several fields, and in order to disseminate first-hand information. They will supply technical assistance to the research committees and collect research items and reports for publication. Assistance in arranging for cooperative projects among the federal government, the states, universities and other research agencies is another important service that may be rendered. The six Departments of the Board cover research in (1) Economics, Finance, Administration; (2) Design; (3) Materials and Construction; (4) Maintenance; (5) Traffic and Operations; (6) Soils.

Cost of Highway Construction

By C. M. UPHAM
(Engineer-Director, ARBA)

I have recently received many letters relative to the trend of highway contractors' bids. In some instances, and a few well-justified, states have declined to award contracts. Other states, even when the bids are only slightly increased, have decided to defer the awarding of contracts until the prices become "normal."

A case study of the cost analysis of highway construction definitely points to the fact that the highways of the future are going to be more expensive. Not only is this true due to the more elaborate design to take care of the traffic demands and to produce safer highways, but all indications point to the fact that the cost of the several unit items will undoubtedly be greater than prewar. However, with the new demands of traffic coming to our highways and the need of increased efficiency in transportation and communications, the awarding of contracts takes on a new standard of necessity. If the contractors' bids are not greatly in excess of the summation of the increased item cost that go to make up that bid then the award should be made. The engineers' estimate should be based on current conditions and not on prices obtained in the past; especially during the depression or during the transition period when the depression was still influencing the contractors bids.

The Public Roads Administration has made an excellent study on price trends in highway construction. These studies have also been made by almost every state highway department in the country. They show that with the 1925-29 period taken as normal the composite mile index is now only ten per cent above normal. It shows that it is now 35 per cent higher than 1941. 1941 was the last year when the abnormal price influence of the depression was still effective. Many of us are still thinking in terms of the prices which existed during the years of the depression. Many comparisons now being made are based on these prices. It will take another depression for these prices to exist again and the state that waits for such prices will simply be deferring the provision of needed highway facilities. The delay will cause much greater economic loss to the people of the state—a loss which will amount to many times the difference between the depression prices and the present day costs.

Excavation Prices

For excavation the average price for the 1925-29 period was 35 cents per cu. yd. This decreased steadily to 21

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cents during the years 1938-40. In 1941 it went up to 24 cents and in 1942—the first real war construction year — it jumped to 37 cents, and in 1943 went as high as 44 cents. It is now back to 35 cents—or exactly the same as 1927. By no possible turn of events can it at any time in the near future return to the price that existed during the depression.

Concrete Pavement Prices

In the case of concrete pavement the average bid price per sq. yd. for the 1925-29 period was $2.29. This can be considered more or less normal. A low was reached in the depression of $1.44 per sq. yd. As late as in 1941, with the depression prices still influencing costs, a price of $1.89 was obtained. The following year, 1942, the price jumped to $2.44 per sq. yd., and the high was reached in 1944 at $2.54. There is a slight reduction in 1945.

In structural concrete, another major item, the 1925-29 period showed $22.65 as a normal average. This dropped to $15.33 during the depression and averaged $19.00 for the years 1937 to 1941. In 1942 this jumped to $26.00 and the peak was reached in 1944 at $31.94. This shows a slight decrease in 1945.

While we realize that with the labor difficulties at the present time and the shortage of manpower, contractors will be playing on the safe side and increasing their bids. Engineers know when this condition obtains and can act accordingly. But the engineer in considering awards should base his judgment upon current normal costs and prices and not those that obtained during the depression as has been the case in many comparisons and considerations of awards during the past months.

The last normal highway programs carried on by the states were completed in 1941. The war contracts followed and it was after 1941 that the prices have increased to about ten per cent more than the levels of the 1925-29 period.

As has been stated before, the present day composite mile index is only ten per cent greater than the 1925-29 period, and even when compared with 1941, the last prewar year and the last year when deflated prices were an influence of the depression, today's price is only 30 per cent greater.

Oregon Study of Prices

As a check on this reasoning I would refer you to the State of Oregon, where a careful study was made on this subject since 1942. When they prepared their estimates for the postwar program they took into consideration the increased prices that would obtain after the war. That these computations were accurate is shown in the first postwar contracts. The engineer's estimates averaged 5.9 per cent higher than the low bids received and were only 2.1 per cent lower than the second bids received. All contracts were awarded.

In taking into consideration the cost of postwar highway work they recog-

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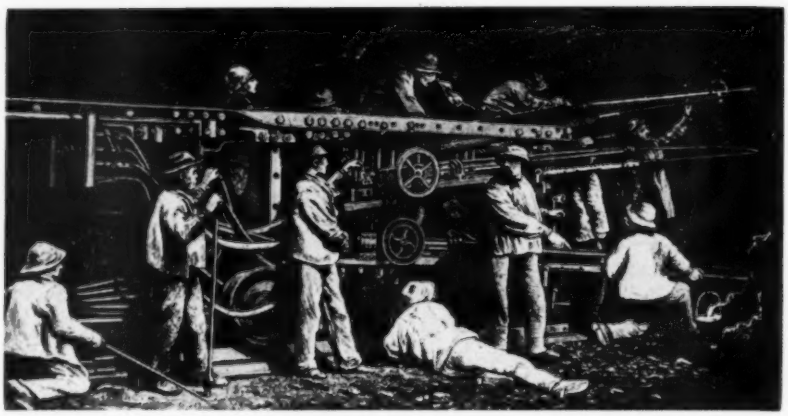
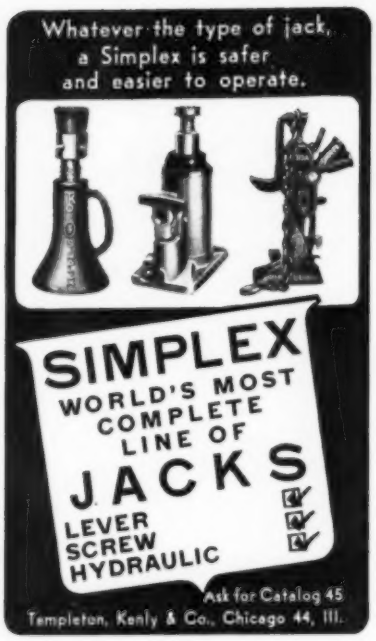
• Drilling on the French side of Mount Cevis Tunnel in 1869. This 10-mile long tunnel, completed in 1871, opened a new era in excavating engineering. It was the first project on which pneumatic tools were extensively used.

Photo from The Bettmann Archive





nized the fact that wages had increased about 35 per cent between 1940 and 1942. While wartime labor increased 65 per cent it is felt that after the war wages will remain 20 per cent higher. Labor at present is uncertain, in amount, quality and cost. Its present attitude is injecting a variable in the equation, making it almost impossible to solve. An analysis of the material situation showed that materials will probably remain ten per cent higher than prewar prices for several years. Equipment and parts will be approximately 20 per cent higher in the first years after the war and then slowly decrease thereafter. Supplies, overhead, and general expense will probably remain 20 per cent higher in the postwar period. Profits to contractors, which were extremely low in the 1939-40 period, will be from five to 15 per cent higher than the prewar period. A summary of these items shows that probably the first year after the war construction costs in some cases may be as much as 30 per cent to 50 per cent higher than the depression period, which would be from ten per cent to 20 per cent greater than the normal 1925-29 period. We know there have been certain advances in different items of construction since this 1925-29 period but some of these have been offset by increased efficiency in machinery and in the methods of doing work.

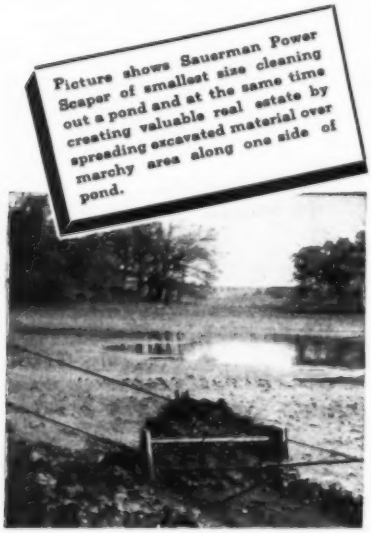
It seems that a state would be entirely justified to award contracts even when they are up to 30 to 40 per cent increase over the 1941 price, or if they are not over ten per cent to 15 per cent greater than the composite mile index obtained in the 1925-29 period. Therefore, it seems that before commissions reject bids for any highway construction a careful analysis should be made up by some such method as I have outlined. To do otherwise would be to defer our great highway program to a point where it will not provide the necessary facilities to meet the demands of transportation.

Delay Would Be Foolish

This, however, does not mean that contracts should be awarded promiscuously. It does not mean that we should delay the program while wishing for impossible prices. We should not use the depression period for our yard stick; but instead use the conditions that are current or that will result from measured factors that cause variations in costs.

The highway engineers and commissions have the greatest responsibility ever yet placed upon their shoulders. They should call for bids and then weigh the increased prices with the economic gains. The engineers are capable of making this analysis. They will know when to award, or reject, or call for new bids. If this is done the chances are that after a few starts, possibly awkward, the highway program will settle down and produce the highway facilities to meet the demands of traffic.

Why "Know How" Contractors *Prefer Rugged* SAUERMAN LONG RANGE MACHINES


Picture shows Sauerman Power Scraper of smallest size cleaning out a pond and at the same time creating valuable real estate by spreading excavated material over marshy area along one side of pond.

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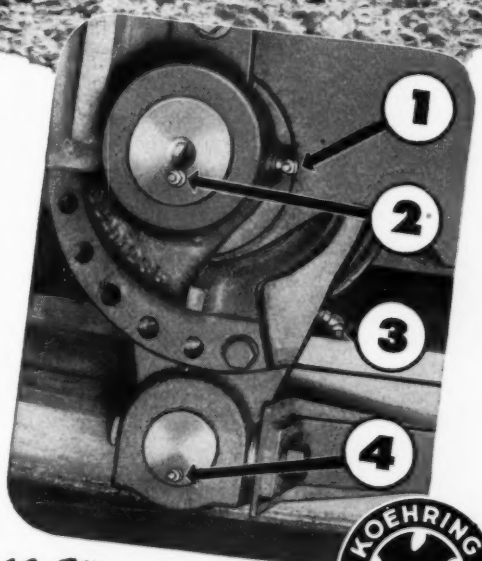

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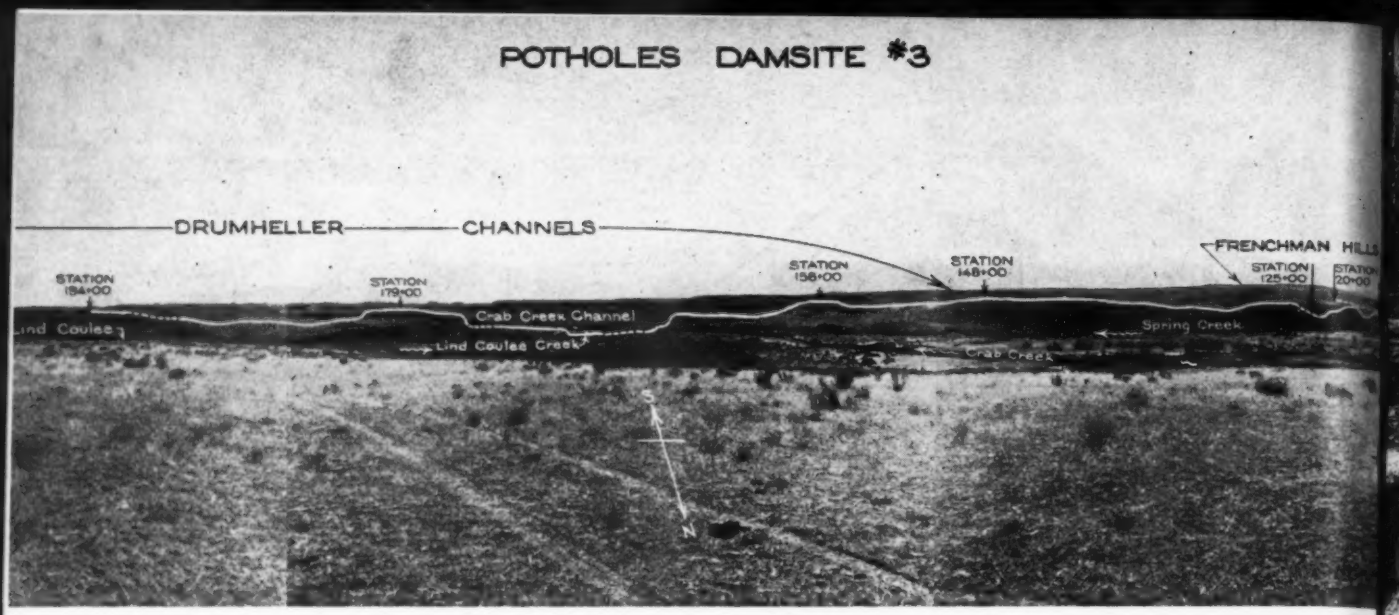

• View showing the approximate axis profile of Potholes Damsite No. 3. The rugged terrain along the damsite from Station 125+00 to 194+00 consists of disturbed rocks of the Lind Coulee Flexure. The flat bottom fill thru which Crab Creek and Lind Coulee Creek have cut gullies will furnish some impervious embankment materials for either dam; similar material can be secured down the Crab Creek Channel below the site shown. The sand and gravel terrace in the foreground from which the picture was taken will be an abundant source of pervious embankment material.

Columbia Irrigation

(Continued from page 241)

goes under the Connell-Northern branch of the Northern Pacific railroad.

At station 430 the canal will drop into Long Lake through a natural rocky channel. From station 753, at the Long Lake dam, to station 1099+18, the Main Canal will be 50 feet wide on the bottom, with a water depth of 20.73 feet. It will be lined throughout and the approximate construction quantities are: rock, 336,000 cu. yds.; common, 1,700,000 cu. yds.; concrete lining, 87,600 cu. yds. There will also be a headworks structure, three highway bridges, two culverts, and a few lateral and farm turnouts.

West Canal

The West Canal will run westerly from the end of the Main Canal, and will have a capacity of 5,100 second feet. From station 0+00 to station 26+00 it will be a lined canal, with a bottom width of 38 feet and a water depth of 16.4 feet. The construction quantities are as follows: rock, 25,000 cu. yds.; common, 135,000 cu. yds.; canal lining, 5,200 cu. yds. From station 26+00 to station 101+00 the canal will cross Dry Coulee by two concrete siphons. The two siphons, separated by about 2,000 ft. of canal, will be 24½ feet in diameter. One will be 4,400 feet long and the other about 1,100 feet long. The quantities for the canal section will be 140,000 cu. yds. of common; 70,000 cu. yds. of compacted embankment; and 4,000 cu. yds. of concrete lining. The siphons will require 11,000,000 pounds of reinforcing steel. Their concrete shells will be 27 inches thick.

West Canal, from station 101+00 to 110+00 will be a lined canal with 40,000 cu. yds. of rock excavation; 4,000 cu. yds. of common; 2,000 cu. yds. of compacted embankment; and 1,800 cu. yds. of concrete lining. The Soap Lake siphon, a steel siphon about 19 feet in diameter and 5,650 feet long, 3,600 feet of which will be across Soap Lake, will be located from station 350+50 to station 407+00. The design has not been completed, but it is probable that the siphon will cross Soap Lake on concrete piers or on a rock fill.

From station 407+00 to station 731 West Canal will be a lined canal with a bottom width of 38 feet and a water depth of 16.4 feet. The construction quantities will consist of 115,000 cu. yds. of rock; 1,200,000 cu. yds. of common; 260,000 cu. yds. of compacted embankment; and 65,000 cu. yds. of concrete canal lining. There also will be two bridges, four culverts, eight turn-outs and six drain inlets on this section.

The Ephrata siphon which is located in the canyon at the west edge of the town of Ephrata will be from station 731 to station 734. It will be a concrete siphon over 20 feet in diameter.

From station 734 to station 944+24 there will be a lined canal with a bottom width of 38 feet and a water depth of 16.4 feet. The construction quantities will consist of 340,000 cu. yds. of rock; 750,000 cu. yds. of common; 160,000 cu. yds. of compacted embankment; and 42,000 cu. yds. of concrete canal lining. There will be five turnouts, seven drain inlets, and probably there will be a road bridge in this section.

A lined canal with a bottom width of 30 feet and a water depth of 16.2 feet will run from station 944+24 to station 1213+60. The construction quantities will consist of 385,000 cu. yds. of rock; 450,000 cu. yds. of common; 164,000 cu. yds. of compacted embankment; and 48,500 cu. yds. of concrete canal lining. This section will have a railroad bridge on the Great Northern Railway at station 1043+20 and several minor structures such as turnouts and drain inlets.

The Winchester wasteway, which will also serve as a feeder canal from the West Canal to the

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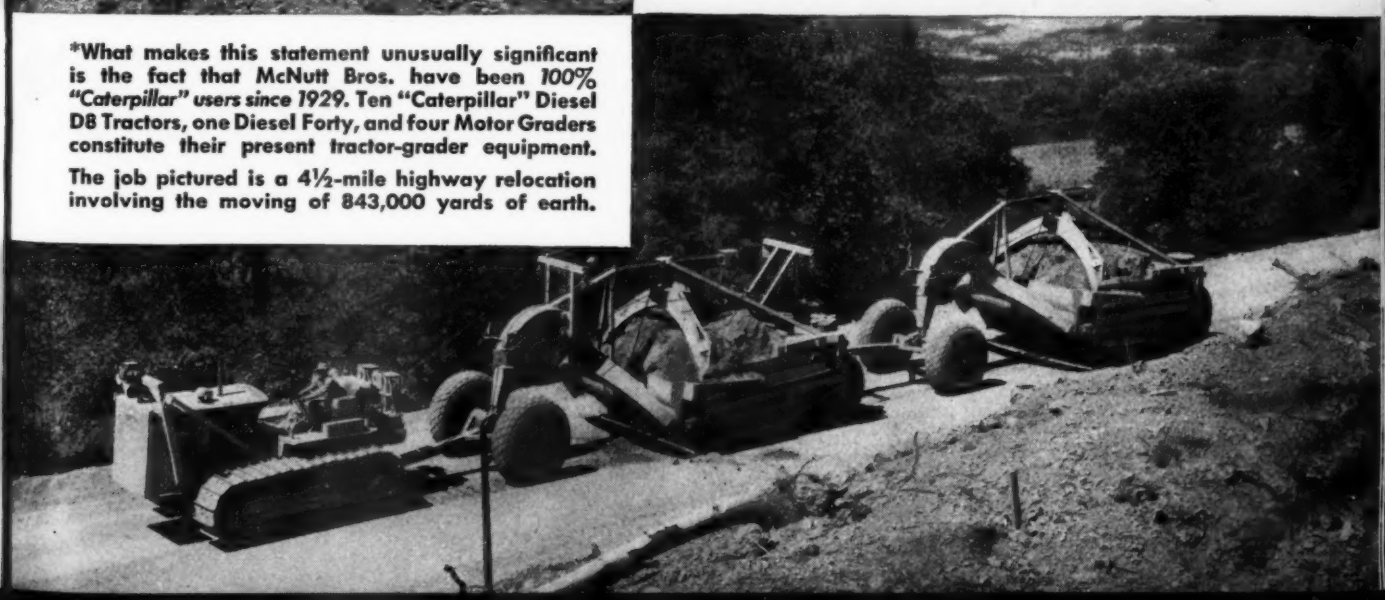
The job pictured is a 4½-mile highway relocation involving the moving of 843,000 yards of earth.



Potholes reservoir, will be located at Station 1213+60.

East Low Canal

The 130-mile East Low Canal will run southerly from the end of the Main Canal. It will have a capacity of 4,500 cu. ft. per second. The final sections for this canal have not been determined, but will be about the same size as those on the West Canal, but less of it will be lined. The principal structures on the first ten miles of the East Low Canal will be the two siphons across the Crab Creek channel. Crab Creek siphon No. 1 will start at station 0+00 and will be 3,300 feet long, with a diameter of about 20 feet. Crab Creek siphon No. 2 will cross under Crab Creek and the Great Northern Railway; it will start at station 57 and will be 1,300 feet long.

PASCO PUMPING UNIT

The Pasco pumping unit will be located on the east side of the Columbia River about 15 miles northwest of the town of Pasco. It will irrigate 5,888 acres of land. There will be a pumping plant with a lift of 177 feet and a 19-mile lateral system with a capacity of 124 second feet at the head. The principal items in construction will be 114,000 cu. yds. of excavation; 30,000 linear feet of pipe, 12 to 42 inches in diameter; 163,000 sq. yds. of canal lining; and numerous turnouts and measuring devices.

The pumping plant will have two pumps and motors and will require about 2000 feet of discharge pipe. Construction quantities in the pumping plant will be in addition to those shown above for the lateral system.

The use of the Grand Coulee as a storage reservoir will also necessitate abandonment of a secondary state highway and about 28 miles of new highway will be built at a higher elevation to replace this. The State of Washington will let contracts for this work and the federal government will pay a large portion of the construction costs representing replacement of present facilities in kind. The state has indicated that contracts will be let separately for different sections. A 1½-mile portion of the new route will involve exceedingly heavy rock work.

Assistant Reclamation Commissioner William E. Warne has advised that all work, aside from the Grand Coulee pumping plant and feeder canal, will be under private contract and by the summer of 1947, if the Bureau's program is authorized by Congress, the monthly payroll in the Basin will be about $1,500,000.

By July of this summer, the Bureau hopes to have not less than 2000 men at work and by 1947 it is expected there will be between 6000 and 7000.

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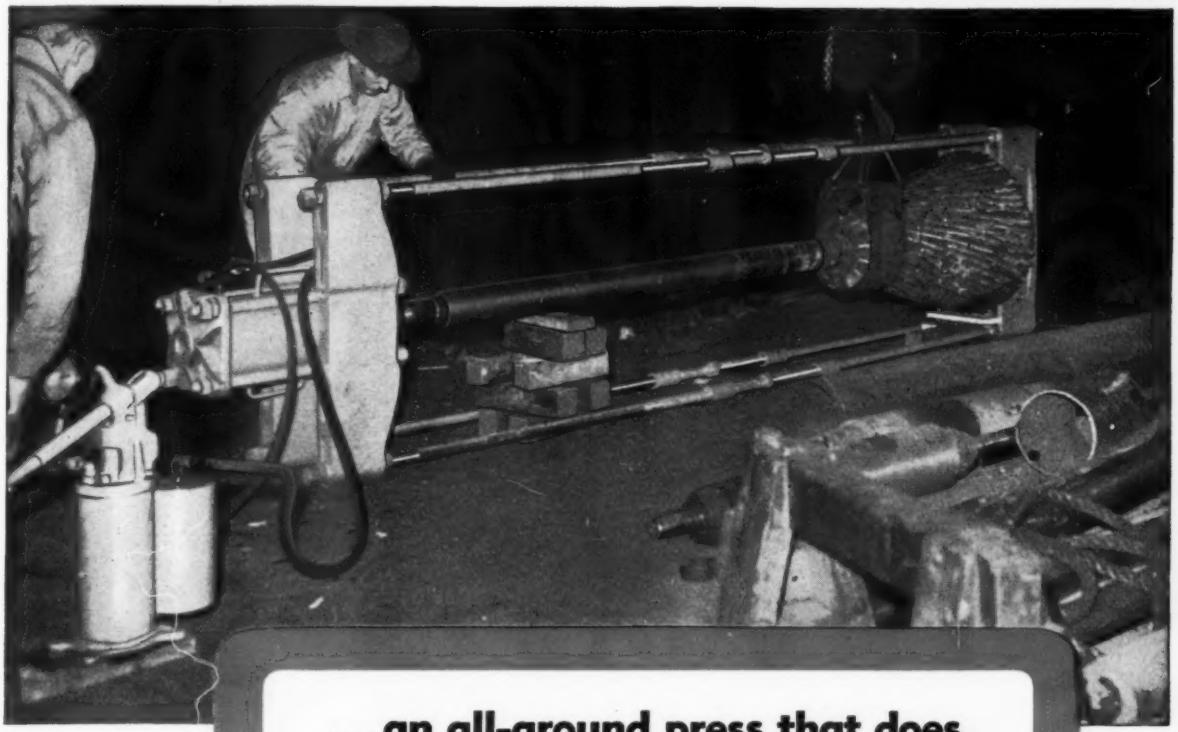

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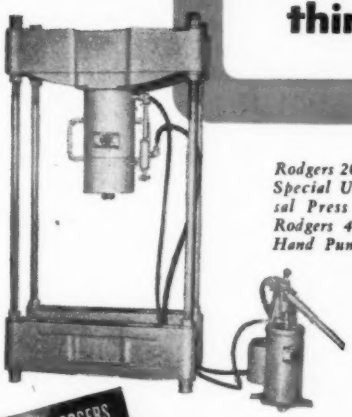

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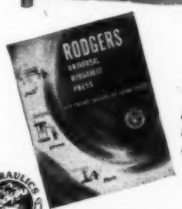

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A lady at a style show was attracted by an evening gown worn by a curvaceous model. "That would look nice at our party next Saturday," she hinted to her husband.

"Sure would. Why not invite her?"

"Of course you understand double entry?" questioned the boss of a prospective new bookkeeper.

"Certainly," replied the applicant. "Nothing to it. Fact is that on my last job I used a triple entry system—one set for the boss to show what the real profits were, another set for the stockholders, showing that there was no profit, and a third set for the income tax people, showing a net loss."

"Next to a beautiful girl, what do you consider the most interesting thing in the world?"

"When I am next to a beautiful girl, I don't bother about statistics."

A concert was being held in a village schoolroom, and it came Sandy's turn to give his bagpipe solo. When he had finished and the applause had died down, a voice from the back shouted: "Give us Annie Laurie, Sandy!"

"What!" asked Sandy, surprised and flattered, "again?"

We never used to be able to find Grandma's glasses, but now she leaves them right where she empties them.

A little girl was proudly showing her playmate their new home. "This is my daddy's den. Does your daddy have a den?"

"No, he just growls all over the place."

Two crows were flying across the country when they were overtaken and passed by a jet-propelled plane. One crow said to the other, "Say, that fellow sure is in a hurry, ain't he?" "Sure," said the other, "and you would be too, if you was on fire the way he is."

"Just think, dear, a new home of our very own!"

Returning to his hotel room for the night, the weary traveler had just got into bed when there came a knock at the door. When he opened it he saw a stranger swaying in the doorway. "Shorry—hic—wrong room."

Ten minutes later the knock was repeated and the same drunk peered in. "Shorry—hic—wrong room."

Ten minutes later the knock was repeated and the drunk opened the door and stood there gaping. "My goodnesh! Have you got every room in the place."

It was pouring. Two men who had quarreled went out in the rain to settle their differences. They fought until one got the other on his back and held him there.

"Will you give up?" he asked, and the reply was "No."

After a time the question was repeated, but again the reply was "No."

"Then," said the other, "will you get on top for a while and let me get under? I'm getting soaked."

Outside a little church near Los Angeles we noticed the following poster announcing the Sunday's sermon: "Do you know what hell is?" Underneath that question and in smaller type was printed: "Come in and hear our new organist."

"Do you know what one little toe said to the other little toe?"

"No, what?"

"Don't look now, but I think we are being followed by a couple of heels!"

A well-developed young lady had a slight cold. As a precaution, upon going to a dinner party, she took along two handkerchiefs, placing the extra one in the bosom of her dress. As dinner progressed she found she needed her spare handkerchief, but feeling about her dress bosom she couldn't find it. She then began to search intently, from right to left, until suddenly she realized every eye at the table was on her. Reddening, she smiled and murmured, "I know I had two when I left home."

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Winston-Utah-Vinnell *speed* work on San Bernardino Flood Control with 6 TOURNAPULLS

High-speed, big-tire flotation and grade-climbing ability help meet high-ball schedule on Lytle-Cajon Levee.

Winston-Utah-Vinnell used 6 Tournapulls to speed production on construction of catch basin, levees and groins on Lytle and Cajon Creeks above San Bernardino, California*. This rush job for U. S. Engineers is to control dangerous flash floods that have done extensive damage each spring to bridges, highways and railroads.

Tough loading in loose wash sand

Material is wash sand and gravel from creek bed, loose, hard to load. To cut loading time and enable Tournapulls to get into high gear fast, the sand is kept damp.

* A previous advertisement discussed work of 6 additional Tournapulls for Contractor Clyde Wood on another section of this same project.

Hauls, one way, run from 800 to 2500 feet . . . Tournapulls show high-speed cycles throughout the entire haul range.

4500′ cycle in 7 minutes

On a 2250′ haul from wash bottom to top of levee, each Tournapull averaged a complete cycle of load, haul, spread and return every 7 minutes. This included pulling loaded up a 125′ ramp of **20%** grade. Rigs operate two shifts, or 16 hours per day, deliver steady, dependable, low-cost operation.

Jobs like this prove Tournapulls' ability to profitably handle **both** long and short hauls . . . tough materials . . . steep grades. Ask your nearest LeTourneau Distributor to give you facts and figures that show why and how Tournapulls can deliver dirt at lowest-net-cost-per-yard for you too. See him today! C30

Tournapulls travel along top of levee, which is being built approx. 25′ high to control Lytle-Cajon creeks.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED Over 4300 Built and Shipped

TOURNAPULLS*

* Trade Mark Reg. U. S. Pat. Off.

TO ADVERTISE: All advertising in this section is payable in advance. Rate: 60c per line, or $7.20 per inch of 12 lines. Minimum charge $2.40. No discounts; no commissions. If no change in copy is desired, three continuous insertions are offered for the price of two. Read these instructions carefully. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Count your own copy to save delay. Be sure to enclose the correct amount of money with your order. Closing date—15th of preceding month. Example: January issue closes December 15th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

SMALL SHOVELS, CRANES AND DRAGLINES UP TO 2½ YDS.

Lorain "40" dragline. 50 ft. boom, ¾ yd. bucket, Waukesha motor. First class condition. $6000.00. **Konsler Construction Company, Henderson, Ky.**

One 50B Bucyrus-Erie highlift steamshovel. Ser. No. 4688, on caterpillar track, 30-foot boom, 19-foot dipper sticks, 1½ yard bucket. In good working condition, located near Birmingham, Alabama. Also: 1½ yard bucket and a lot of spare parts for 50B steamshovel.

For further information and inspection arrangements, write to:

Hugo Neu
31 Nassau Street
New York 5, New York

MISCELLANEOUS EQUIPT.

Shovel front for 37B, first class condition price $1500 and located Duluth, Minn. Contact Delta Farms Company, Lockport, La.

⅛ yd. Shovel front and backhoe for Byers Model 60. Good condition.

Blazer-Jenkins Concrete Co.
Gallipolis, Ohio
Phone 862-R

For Sale—

SHASTA DAM SAND AND GRAVEL PLANT AND 10-MILE CONVEYOR EQUIPMENT

Including:

8500—36" AND 42" IDLERS.
Pulleys and Drives.
LATE MODEL 200 HP., 1800 R.P.M. GE MOTORS, complete with Starting Equipment.
Western Gear Reducers, 200 HP., 40 to 1 Ratio.
8 x 12 MARCY ROD MILL.
Dorr Hydroseparators and Classifiers.
30" Tripper and Trestle.
Merrick Feedoweights and Weightometers.
All Types of Pumps, complete with Drives.
42" Pendulum Boom Conveyors, 100' and 200'.
Electric Line Equipment, Transformers, Motors and Supplies.
Other Miscellaneous Contractors' Equipment.

Subject to Prior Sale

Write, Wire or Telephone Redding 1440

COLUMBIA CONSTRUCTION CO., INC.
Box 579 Redding, California

ENGINEERS AND MECHANICS step up your own skill with the facts and figures of your trade. Audels Mechanics Guides contain Practical Inside Trade Information in a handy form. Fully Illustrated and Easy to Understand. Highly Endorsed. Check the book you want for 7 days' Free Examination. Send No Money. Nothing to pay postman.

- ☐ Marine, $4
- ☐ Machinist, $4
- ☐ Shipfitter, $1
- ☐ Radio, $4
- ☐ Diesel, $2
- ☐ Mathematics, $2
- ☐ Sheet Metal, $1
- ☐ Blueprint, $2
- ☐ Electricity, $4
- ☐ Welders, $1
- ☐ Plumbers, $6
- ☐ Carpenters, $6
- ☐ Auto, $4
- ☐ Refrigeration, $4

If satisfied you pay only $1 a month until purchase price is paid.

AUDEL, Pub., 49 W. 23rd St., N. Y. 10, N. Y.

SURPLUS DIPPERS FOR BUCYRUS-ERIE SHOVELS

2—¾ cu. yd. Skimmer Scoop Dipper—10-B.
2—½ cu. yd. Drag Shovel Dipper—17-B.
3—½ cu. yd. Skimmer Scoop Dipper—17-B.
1—¾ cu. yd. Welded Dipper—21-B.
1—1¼ cu. yd. Drag Shovel Dipper—38-B.
1—1½ cu. yd. Heavy Duty All Cast Dipper—42-B.
1—1½ cu. yd. type 4 Med. Duty Dipper.
1—2 cu. yd. Rock Dipper—75-B.
1—2¼ cu. yd. Inserted Type Dipper—50-B.
1—2¼ cu. yd. Inserted Type—55-B.
1—3½ cu. yd. Coal Loading Dipper—75-B.
1—4 cu. yd. Type IV Medium Duty Dipper—100-B.

F.O.B. Works

Write for any further information desired.

BUCYRUS-ERIE COMPANY
Parts Department
South Milwaukee Wisconsin

"Building Construction Cost Data"
1946 (4th) Edition

A 72-page booklet of tabulated construction costs. 1150 Items broken down for labor and material. Arranged alphabetically and index cut A to Z. Concise, Comprehensive and Up-to-date. $1.60 Postpaid.

R. S. Means
P. O. Box 62X, Duxbury, Mass.

HELP WANTED

STEEL SALES ENGINEER

Young man with sales engineering experience and executive ability as Assistant to Sales Manager. Knowledge of fabricated steel and plate work required. Send references with first letter. **Box 9259**

POSITIONS WANTED

Shovel operator desires steady work in quarry or open pit mine. Familiar with Bucyrus-Erie equipment. Can furnish excellent references. Married, 40 years old. **Box 9260**

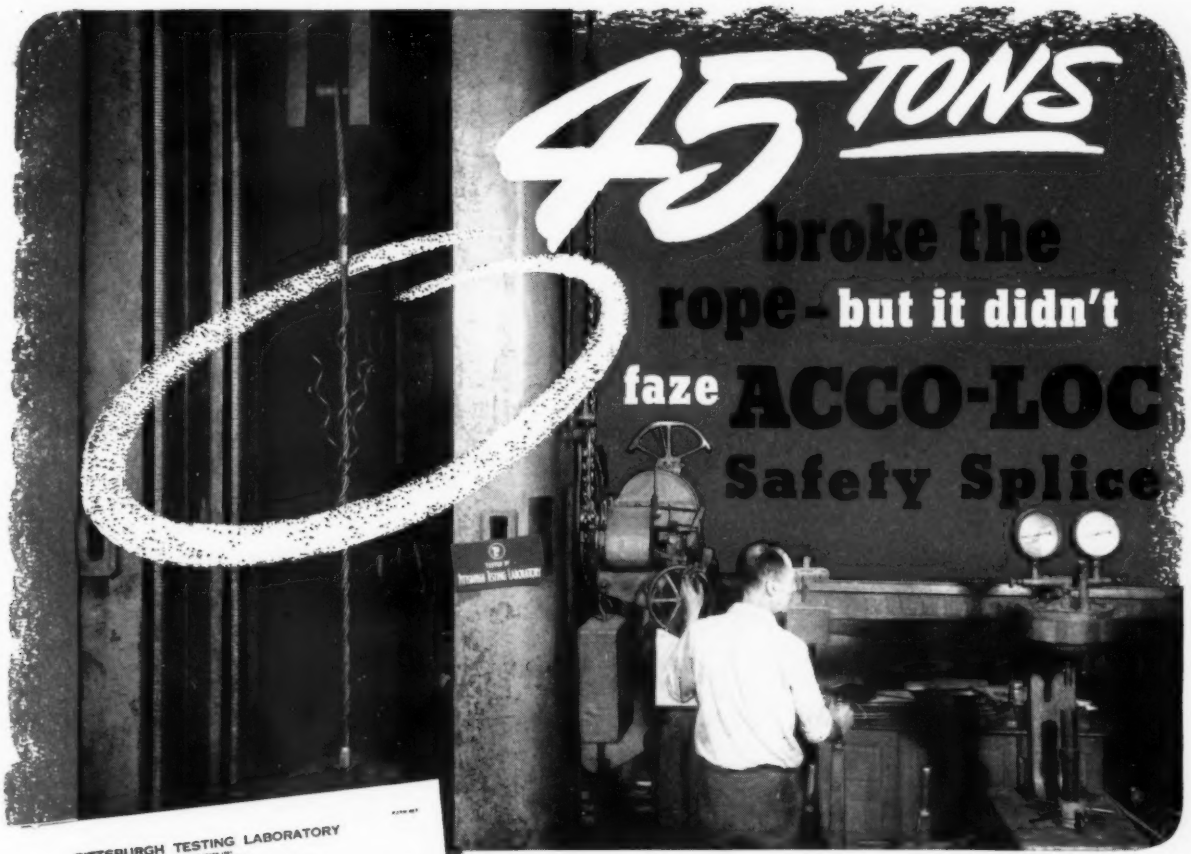
Notes from the manufacturers

Gar Wood Industries, Inc., Detroit, has named R. J. Nymberg sales manager of the hoist and body division. Other appointments saw Henry Husbands named to assist Amos E. Heath, district manager of the company's general line in Washington, in contacting government agencies; Ross Miller temporarily appointed as manager of Gar Wood's Philadelphia branch (hoist and body division). Edward F. Kreutzfeld has been named service manager of the above named division to succeed Mr. Miller: William F. Keeton and Charles J. Hoffman have been placed in charge of the company's newly-created advertising and export departments respectively.

Cleveland Pneumatic Tool Company, Cleveland, Ohio, has accepted the resignation of George P. Torrence, president, and John S. Clark, vice-president. The executive posts and directorships held by these men will not be filled at present.

Jones & Laughlin Steel Corporation, Pittsburgh, has established new district sales offices in Los Angeles, San Francisco, and South Bend, Indiana. Appointed district sales manager in Indianapolis was H. M. Knobloch. R. G. Scoggins takes over the district sales managership in Los Angeles succeeding T. W. Bell who was appointed special sales representative in Los Angeles. Newly appointed district sales manager in San Francisco is W. S. Wainright. W. L. O'Connell has been named resident manager of sales in South Bend.

The Four Wheel Drive Auto Company, Clintonville, Wisconsin, announces a recapitalization program consisting of the sale of 14,233 new shares of stock to be followed by a stock allotment of 100,000 shares. Capitalization of the company, after distribution of these two blocks of stock, will be 300,000 shares with a par value of three million dollars. Prior to the stock sale and allotment, capitalization of the company was for 185,767 shares with a par value of $1,857,670.



45 TONS broke the rope - but it didn't faze ACCO-LOC Safety Splice

PITTSBURGH TESTING LABORATORY

PITTSBURGH, PA.

LABORATORY NO. 363283

FILE NO. 11009.19

TEST NO. PH-796

REPORT

July 14, 1943

Tensile test of - Wire rope assemblies made of 6x19 PREFORMED Improved Plow Steel Wire Rope with Independent Wire Rope Center with ACCO-LOC SAFETY SPLICE Loop on each end.

Reported to - American Chain & Cable Co., Inc. Wilkes-Barre, Pa.

TEST NO.	ROPE DIAMETER	ACTUAL BREAKING STRENGTH	MINIMUM REQUIRED BREAKING STRENGTH	TYPE OF FRACTURE
1	3/8"	14,660#	12,800#	4 strands & center
2	3/8"	14,680#	12,800#	5 strands & center
3	3/8"	14,660#	12,800#	
4	1/2"	26,010#	22,400#	4 strands & center
5	1/2"	25,850#	22,400#	4 strands & center
6	1/2"	26,050#	22,400#	
7	3/4"	50,900#	49,900#	3 strands & center
8	3/4"	51,750#	49,900#	4 strands & center
9	3/4"		49,900#	3 strands
10	1"	91,000#	87,600#	4 strands & center
11	1"	94,250#	87,600#	4 strands & center
12	1"	95,050#	87,600#	3 strands & center

RESULTS:
1. All specimens exceeded the minimum required breaking strength.
2. After testing, all ACCO-LOC SAFETY SPLICES were intact. None showed visible deformation.

NOTES:
1. All minimum breaking strengths from Federal Specification RR-R-371a for Wire Rope, dated May 8, 1942. Reference Table XXVI for 3/8" dia. rope, Plus 7-½ for IWRC. Reference Table XXVIa for 1/2", 7/8" and 1" dia. wire ropes.
2. For tests 1 to 9 and 12 inclusive speed of testing machine 1-1/16" per minute.
3. For tests 10 and 11 speed of testing machine 7/16" per minute.

PITTSBURGH TESTING LABORATORY
R. H. Lincoln
Physical Test Section

⅜" to 1" TRU-LAY Preformed wire ropes, equipped with ACCO-LOC Safety Splices, pulled to destruction — without the slightest effect on the rope terminals. That test was made by the Pittsburgh Testing Laboratories. But it is in the thousands of plants where ACCO-LOC Safety Splices are daily proving their 100% efficiency that the test of true worth is appreciated. — Compact, neat, flexible, made without distortion of rope structure, the ACCO-LOC Safety Splice is a revolutionary advance for wire rope endings. Send today for fully detailed literature.

ARMY-NAVY "E"

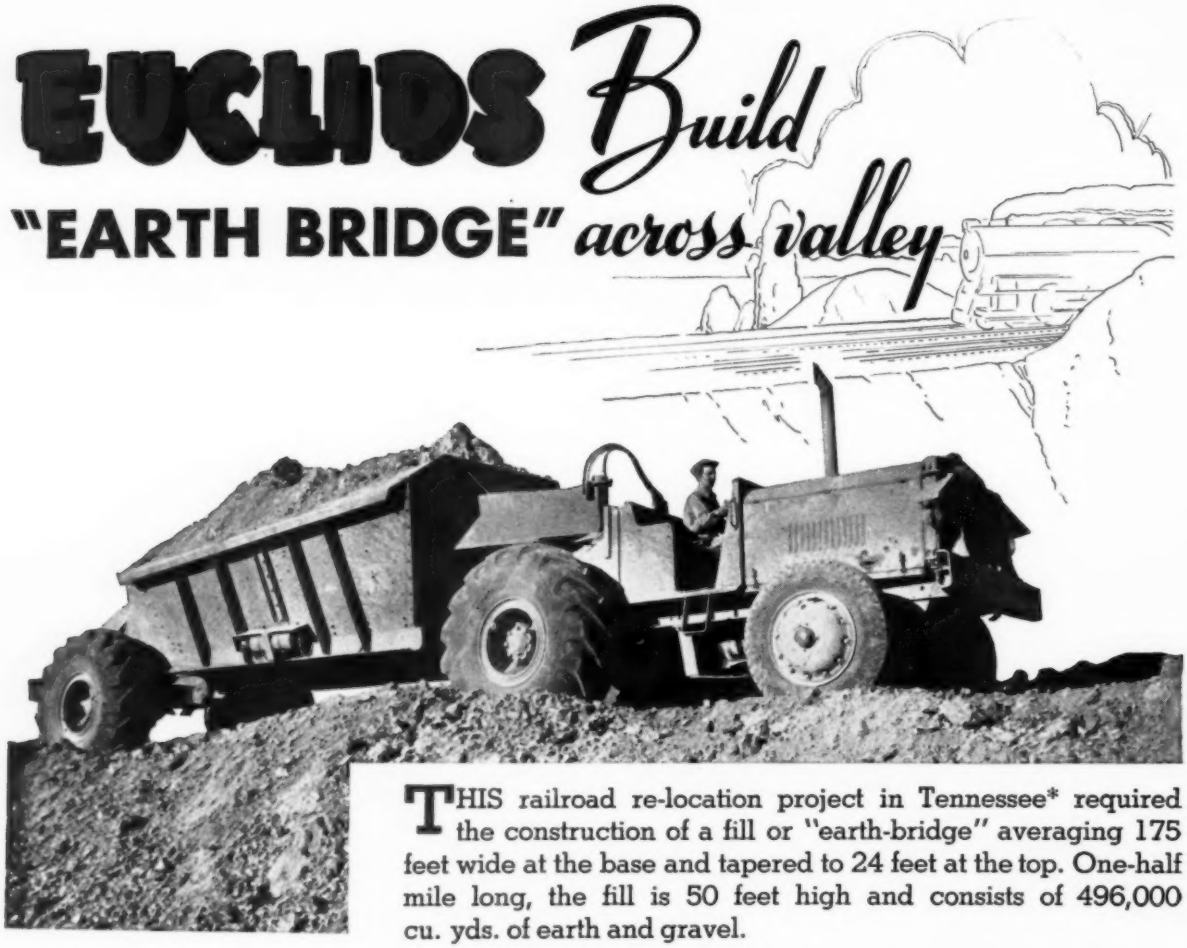
ACCO Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Emlenton, Pa., Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

EUCLIDS *Build* "EARTH BRIDGE" *across valley*



THIS railroad re-location project in Tennessee* required the construction of a fill or "earth-bridge" averaging 175 feet wide at the base and tapered to 24 feet at the top. One-half mile long, the fill is 50 feet high and consists of 496,000 cu. yds. of earth and gravel.

The Wolfe-Michael Co. used five Bottom-Dump Euclids of 13 yd. capacity which were loaded by a 1¾ cu. yd. shovel. Average speed of the Euclids for the 7,040 ft. haul was 12.5 m.p.h. including turns on fill and at the loading shovel.

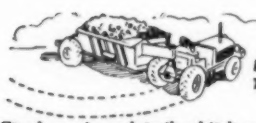
Exceptional maneuverability and short turning radius of the Bottom-Dump Euclids were important on this job because of the close working quarters and narrow fill. Fast travel speed on the difficult haul road and the ability of Euclids to dump their loads quickly saved time and reduced hauling costs.

All Euclid models, Rear-Dump and Bottom-Dump, are designed and constructed for a single purpose — to move earth and other materials over off-the-highway hauls at lowest cost. Your Euclid distributor will be glad to provide information and specifications on the models best suited to your requirements.

*Part of the improvement program of the Nashville, Chattanooga and St. Louis R. R. near Dickson, Tennessee, west of Nashville.

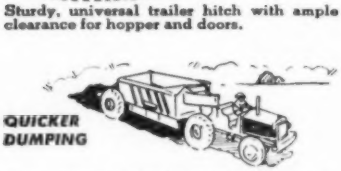
★

BOTTOM-DUMP EUCLID ADVANTAGES



FASTER TURNING

Sturdy, universal trailer hitch with ample clearance for hopper and doors.



QUICKER DUMPING

Steep, smooth sides of the trailer and unobstructed door openings full length and width — control for opening and closing the doors is conveniently located on the steering column.

★

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO